AMERICAN
DYESTUFF REPORTER

DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
• BLEACHING • DYEING • FINISHING • PRINTING •
AND THE NECESSARY MECHANICAL EQUIPMENT

"Circulated Everywhere Textiles Are Processed"

VOLUME XXV | FEBRUARY 24, 1936 | NUMBER 4

CONTENTS OF THIS ISSUE

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

General Index

Some Observations of the Two-Bath Method of Dyeing Silk Hosiery 85
By Arthur E. Cobin and Samuel G. Newman

Technical Notes from Foreign Sources 87

Open Forum 110

Index to Proceedings of American Association of Textile Chemists and Colorists

Fifteenth Annual Meeting:
Friday Evening Session P91
A Resume of the Properties and Uses of Ultra-Violet Radiation P92
A paper by Joseph L. McEwen
The Application of Optical Instruments in the Textile Industry for Routine and Research P96
A paper by J. H. Schering

New Developments in the Applications of Vat Colors on Cotton Piece Goods P104
A paper by S. H. Williams
January Meeting, New York Section P95
January Meeting, Rhode Island Section P103
Calendar of Coming Events P103
Ninety-eighth Meeting of the Research Committee. P106
Notice to Manufacturers and Importers of Chemicals for the Textile Industry P106

Editorial:

Is Experience a Help or a Handicap? 107

Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

Published Every Other Monday

HOWES PUBLISHING CO. ~ ~ 440 FOURTH AVE. ~ ~ NEW YORK

CLOSING DATE FOR ADVERTISING COPY . . . . . MONDAY PRECEDING ISSUANCE DATE

CALCOLOID POWDERS ★

FOR LEVEL DYEINGS AND LOWER COSTS

These vat color Powders • the ultimate in dispersion • give perfect results in package and pressure machines.

The following standards are available ★

★ CALCOLOID BLACK BRD Double
★ CALCOLOID DIRECT BLACK JD Double
★ CALCOLOID NAVY BLUE NTD Double
★ CALCOLOID DARK BLUE BOD Double
★ CALCOLOID ORANGE RD Double
★ CALCOLOID GOLDEN ORANGE GD Double
★ CALCOLOID GOLDEN ORANGE RRTD Double
★ CALCOLOID PINK FFD Double
★ CALCOLOID SCARLET 2GHN Double
★ CALCOLOID VIOLET 6RD Double
★ CALCOLOID YELLOW GCD Double

★ Patent applied for

Calco

"UNTIL YOU'VE USED A CALCOLOID YOU HAVEN'T USED A DISPERSED POWDER"

Write us for samples and complete information

THE CALCO CHEMICAL COMPANY • Inc.
• A Division of American Cyanamid Company
BOUND BROOK • NEW JERSEY
NEW YORK • BOSTON • PHILADELPHIA
PROVIDENCE • CHARLOTTE • CHICAGO

AMERICAN
DYESTUFF REPORTER

VOLUME XXV FEBRUARY 24, 1936 NUMBER 4

Some Observations of

The Two-Bath Method

of Dyeing Silk Hosiery

By ARTHUR E. COBIN and SAMUEL G. NEWMAN*

A GREAT deal of ink and pulp has been consumed in the dissemination of knowledge concerning the dyeing of silk hosiery. Much information has been gained by the trade through such written as well as verbal discussions. However, the knowledge to be divulged about this art (for dyeing is an art), is far from having been exhausted. The subject, "Dyeing of Silk Hosiery," is so large that a single general discussion cannot more than touch very lightly on any phase of it. Each separate branch of this subject should be treated independently and we hope in the future that we will be able to cover some of these other angles. Even in each separate branch of the dyeing of silk hosiery no fast and set rules can be set down as each school of dyers has its own methods of handling this matter as well as the necessary changes due to peculiarities of local conditions and variations in the qualities of the hosiery itself. The following facts are, therefore, offered to the reader for what they are worth.

The two-bath method is the older, the more orthodox method of dyeing silk hosiery and is still used in many mills where time and slightly higher costs are not important factors. It is the ideal method for the removal of the foreign matter present in pure silk hosiery such as oils, greases, and dirt picked up during manufacture as well as the dissolving of the natural integument of gum on the silk. Common sense dictates that it is a better practice to dye the fabric after it has been thoroughly cleansed of all foreign substances and a definite amount of sericin removed. The degumming in the two-bath method is done more efficiently and better scouring conditions can be maintained. The degumming agent may be a neutral low titer olive oil soap or a boil-off oil. Either one of the degumming agents is good.

The amount of soap or oil employed depends on the nature of the water, the type of throwing oils in the goods, and the nature of the hosiery to be processed. It takes from 8 per cent to 15 per cent of a high percentage soap to properly degum silk hosiery. To be on the safe side, it is better to use a small controlled excess amount of the degumming agent, bearing in mind that overscouring may give a poor looking and poor handling product. Nevertheless with intelligent study, the processing of a particular style of hosiery several times will eventually determine the correct and best amount of boil-off compound to use. A supply of soft water in the boil-off bath is, of course, a universal demand.

The goods are added together with the degumming agent and are worked for thirty to forty-five minutes in this bath. The hosiery is then given two warm rinses and one cold rinse. It is important that the goods be washed completely of all the soap. Some dyers favor overflooding the bath for a minute or so before dropping it. This, they believe, will wash away all suspended substances. Otherwise, the goods will retain them if the bath is just dropped. After rinsing, if tangled, the hosiery is hydroextracted, loosened, rebagged, and then dyed in a fresh bath with the aid of Glauber's salt or common salt depending on the type of dyes and method used.

Perhaps one of the most important requirements for satisfactory dyeing is a good penetration of the dyestuff into the fiber. When certain portions of the stockings such as the seams and splicings do not take up the dyestuff evenly and uniformly, the causes may be laid to an ineffective or an insufficient degumming treatment or a weak boil in the dyebath. Attempts to reduce the amount of degumming compound for economic reasons may lead to the definite appearance of light portions in the seams and splicings. With the return of the old formula of an increased amount of degumming compound, the light portions in the seams and splicings will probably vanish and the goods will once more take on the appearance of an even distribution of the dyestuff. If this does not im-

*National Hosiery Dyeing Works, Boston, Mass.

prove the poor penetration, the dyer should then look to his dyeing conditions. A good strong boil should help correct this fault. It is assumed that the machine is not overcrowded and that a correct liquor level is maintained, which is determined by the type of dyeing machine used and the weight of the goods in the machine.

The causes of streaky dyeings are as sundry as the causes of marital divorces today. In fact, to obtain streaky dyeings, one needs to digress even less from the "straight and narrow path" of rules than from the corresponding marital relations' rules. Some of the causes of streakiness are improper salting, a poor boil, overcrowding the machine, too short a liquor bath, tangled goods, use of improper dyes, etc.

A few of the reasons for unevenness in the color may originate before the stocking reaches the dyer. Perhaps the materials used in soaking the silk yarns may have oxidized and turned rancid. The silk may have come from different soaking baths or else mildew may have set in before reaching the dyehouse. The addition of common salt instead of Glauber's salt, in certain dyeings, in a haphazard manner will cause streaks. A streaky appearance will also result in the lisle welts of service weight hosiery if the salt is added before the boil, or if some direct dyestuffs are used that were not tested previously for level dyeing qualities.

Good even dyeing results are obtained when the bath is not allowed to reach a boil in less than twenty minutes and the stockings then boiled for fifteen minutes before salting. A strong thirty-minute boil before salting is more preferable. Then sample fifteen or twenty minutes later. The addition or omission of penetrants or other dye assistants depends upon the type of goods being processed and the conditions present in the dyehouse such as the quality of the water, type of dyes, etc. A good dyeing assistant will retard absorption, thus hindering the dyes from rushing on the fibers to cause unevenness.

Further means of reducing the possibility of streaks in hosiery is to extract, loosen, and rebag the goods after degumming. In this way, the goods will not be tangled up at the time the dye is added. When a lot comes up close to the standard match so that only a small addition of dyestuff is necessary to obtain the desired shade, another possible cause of streaky goods is eliminated. If several large additions of dyestuffs are necessary, the dyer is running the risk of finding streaks in the goods by the time the match is obtained. Fortunately, it is a consolation to add that in the two-bath method, where it is less difficult to control the dyebath, lots will come up very close to the standard match with the first sample taken. Once a good dyeing formula is developed, only a miscarriage of instructions will bring on difficulty for the dyer to easily obtain the same match.

Dyers employ various techniques in securing the desired shade or tone. When the lot on first sampling shows that it needs some definite color, many dyers will add the quantity of deficient dyes. Some dyers will let the lot run in the cooling bath for a few minutes with the addition of salt to help exhaust the dyebath and in this way get their match from the unabsorbed dyestuffs that the lot will pick up. Of course, the tone that the lot of goods takes on in this way depends on the type and amount of dyestuffs present in the bath. Since no soap is present in the dyebath, some salt can be added to the cooling bath without the fear of soap spots or other obstacles that common salt and soap mixtures present. When the silk leg is darker than the cotton welt or plait or the cotton is darker than the silk and difficulty is encountered in making ordinary additions of the dyestuffs to produce a good union, a knowledge of special dyes is necessary so that silk colors are used which do not dye cotton or cotton colors are used which do not dye silk. Some dyers favor an addition of soda ash to make the bath slightly alkaline which will assist the toning of the cotton, but this we do not recommend because it is risky.

Sleaziness constitutes another headache developer for the dyer. It is the irregular, uneven shaped loops in the knitting that give the stocking its sleazy appearance. Any of the operations that a stocking travels through, from the throwing point to the final stage in finishing, may be the cause of sleaziness. Some of the reasons may be uneven silk, improper winding, incorrect yarn tension on the knitting machine, or running dry silk and other possible causes too numerous to mention and about which there is an insufficiency of knowledge. It is admitted that if a stocking passes through the manufacturing process without a sleazy appearance, the chances are excellent that it will come through the dyeing operation without this defect.

However, when sleazy work does leave the knitting room, the dyeing department may help correct this condition appreciably by careful processing. When these distorted stitches were first noticed in dyehouses, it was thought to be the result of faulty processing. An attempt was made to remedy this defect in the finishing bath. Various finishes were tried in different combinations. Some finishing bath formulae were established which did correct sleaziness to a certain extent. Experiments were also carried out with the degumming bath by varying such factors as the amount of degumming agent, temperature and time, without any successful results. Finally, by adding the goods to the boil-off bath at the temperature at which the degumming takes place, a marked improvement in the appearance of some types of goods was noticed, but this, of course, we do not mention as a corrective for all types of goods.

The highest efficiency and the maximum production can be maintained when definite procedures of routine are followed. This is true for the two-bath method as well as for any other. Various styles of hosiery may sometimes be dyed together fairly close to a given shade. However, it retards production and is uneconomical in general to dye service weight silk hosiery and sheer chiffon lots in the same machine. It is much better practice to dye a batch made up of only one style. A 100-pound

machine should not be loaded with a lot weighing 50 pounds or 140 pounds. The best results are obtained in the shortest time when the batch consists of one style of goods and weighs as close as possible to 100 pounds for a 100-pound machine. This effects economy, greater production and higher efficiency. However, rare indeed is the hosiery dyer who can hope to experience such ideal conditions in his dyehouse.

The ever-changing styles and changes in the construction of silk hosiery are adding to the difficulties of the dyer each day. The method employed today in one mill for certain styles of goods may have to be discarded tomorrow to meet the demands of the trade. Therefore, no hard and fast rule can be set down for the hosiery dyer. Hosiery dyeing, as mentioned before, is an art and is acquired only after many years of effort and experience. The suggestions and observations of hosiery dyers that appear in trade journals from time to time applied together with common sense and the effort of improvement will do much to solve many of the problems of hosiery dyeing in the individual mills.

Technical Notes from Foreign Sources

Application of the TCB Colorimeter to the Determination of pH and to the Study of the Ageing of Solutions of Chromium Salts

M. Lesbre—TIBA 11, 243 (1933).—This is the second and concluding section of the above paper (the first section has already received comment), which, as previously noted, is a description of certain methods employed in the author's larger study of the direct cotton dyestuffs.

This section of the paper deals entirely with the colorimetric determination of the degree of ageing (the author calls it evolution—it might also be called ripening) of chromium salts in solution, and in particular that of the crystallized green chloride. His method, it may be recalled, consists in the following up of the color-changes colorimetrically, as accompanied by a parallel checking-up of the changes in the flocculation index.

In a solution containing 4.45 g. of the chromium chloride per liter, the determination of the index of flocculation gave a consistent value for a solution aged for 300 hours, with a maximum at about 72 hours, thus establishing the fact that two processes must have been proceeding simultaneously, one complete in three days, the other still going on, or beginning at that point. The determination of the electrical resistance of the solution showed a steady decrease, which ended after 300 hours, when the evolution of the solution was complete. No minimum was determined, but the variations in resistance, very marked during the first three days, were considerably more moderate as the end of the ageing process approached. The figures obtained by colorimetric study show that the degree of greenness of the solution decreases regularly to the point at which, after 300 hours, equilibrium has been reached. With the blue, the violet, and the red, however, an increase in their colorimetric value is noticed during the first 24 hours, then a period of stability becomes evident, and then a decrease in the values, at about 72 hours, sets in for the blue, and after about 124 hours for the violet and red also.

It appears, then, that the variations in the value for green are convenient to follow, in order to visualize the integral evolution of the solution; but, during the first stage of the ageing, the variations in the value of the blue are the ones most pronounced. It is probable that, for the conditions prevailing in this case at least, it is during the first hours that the formation of the grayish-blue chromium salt is most active. The existence of a maximum in the blue, the violet, and the red makes it possible to detect the existence of processes going on, in a manner which seems to be superimposed upon that which corresponds to a simple transition from the green to the blue form; and the variation in the index of flocculation accords with the information given by the colorimeter. It seems probable that these superimposed phenomena are those of polymerization of the basic salts which are forming during the process of ripening. A graph (Fig. XVII) shows the colorimetric values of a fresh and of a completely aged solution; in the fresh solution, the maximum is in the green; in the aged solution, in the blue and in the red (two maxima). The author expresses the conviction that the latter maximum (for the red) is determined by the phenomena of polymerization.

Two other cases were studied: one, a solution of the same chloride, at a concentration of 44.5 g. per liter. It was impossible, with this concentration, to follow the evolution of the solution by means of the variation of the index of flocculation. The electrical resistance decreased steadily, in two phases, separated by a fixed boundary, extending from 150 to 240 hours. Colorimetric study showed a regular decrease in the green value, which did not become stationary until after 1,200 hours; the other colors showed a maximum between 150 and 240 hours, and then began to decrease, becoming stationary at about 1,200 hours. A graph (Fig. XVIII) shows the values obtained in the colorimetric study of this concentration.

Still another solution, of 35 g. per liter, of the same chloride, was studied, and a graph (Fig. XIX) is added, of the results; but there is no essential difference between cases 2 and 3.

The author's conclusions as to his work upon chromium salts are as follows: (a) two solutions, of the same percentage value in Cr_2O_3, of a normal chromium salt will not be identical in composition, and therefore in action, unless their colorimetric examination gives two graphs of identical color-value, showing that the solutions are at the same point of evolution; (b) the evolution of such solutions may be followed easily by the variations in the dominant color.

The study of the conductivity of chromium chloride does not always show the existence of secondary phenomena of polymerization, as is the case with solutions of chromium sulfate (this does not mean that the condition is not present). The existence of maxima for the blue, violet, and red make it possible for the colorimetric method to show that, upon the simple passage of the green to the blue chloride, there are superimposed other phenomena, which correspond certainly to polymerization of the intermediate basic salts formed, in the course of hydrolysis and regrouping of the hydrolytic products. The solutions correspond to those which are employed technically in tanning, whose properties vary to a considerable degree, according to their state of ageing, and, consequently, according to the condition prevailing at the time of their preparation.

If one adds to a freshly prepared solution (prepared in the cold) of green chromium chloride in crystals, one molecule of soda per molecule of chloride, and immediately adds, still in the cold, a molecule of hydrochloric acid, the fresh green chloride will be regenerated in solution (does the author mean "equivalent" rather than "molecule"? One molecule of sodium carbonate will not precipitate one molecule of a chromium salt completely, nor will one molecule of hydrochloric acid redissolve even the amount of chromium hydroxide thus formed—unless the intention is to produce a decidedly basic chloride). If, before adding the hydrochloric acid, the basic mixture (apparently, from this, the author does mean actually "molecule," but the difficulty regarding the amount of acid still exists) is warmed to 50° C. for a short time, the addition of HCl will then also produce some of the violet chloride $(Cr(H_2O)_6)Cl_3$. But the solution of a basic chromium chloride prepared in the cold will still differ from one prepared thus, and it is important to be able to ascertain the degree to which the solution has evolved at the moment of its use.

(Note—The above work seems to have deserved excerption in relation to the connection with the larger, important paper upon the direct cotton colors. But, though it may appear to have, perhaps, no very direct bearing upon dyeing processes as far as is known at present, yet one would hardly be justified in waving it aside upon that ground. A large problem, as yet entirely unsettled, relating to solutions of chromium salts used in tanning, and in chroming of wool—certainly a problem in the colloid chemistry of dyeing—still awaits solution; we speak of using chromium chloride, chromium acetate or formate, chrome alum, and we evidently do not know of what we are speaking. In another field, too, not directly connected with strictly textile work, but lying in the same group of problems, it is notorious that chrome alum, itself or as a constituent, in photographic fixing and hardening baths, as well as being the agent used to preharden the gelatine of the emulsions for both paper and glass and cellulose acetate coatings, loses its valuable property of controlled hardening of the gelatine within a few days—a fresh bath hardens gelatine in a manner almost suggesting that of formaldehyde, while the same solution, unused in the course of a week, may possess, then, little more hardening action than so much water—and yet the substance is chrome alum, a supposedly very stable substance, if there be any such. Lesbre's work is fascinatingly suggestive as to the whole problem of what solution of a chromium salt really is, and may prove really to deserve the commendation of fundamental.)

Glycerol-Phthalic Acid "Resins" in the Textile Industry

Dr. Ernst Schlenker—Monats. f. Textil-Ind. 48, 173 (1933).—Recent patents have put it into the power of the textile chemist to experiment with, and quite probably to utilize, a rather new type of synthetic resins, which have already forced their way into the most varied fields of usefulness, and are now beginning to penetrate into the textile field. The resins in question are those which, in the fundamental aspect, are prepared by fusion of phthalic acid or anhydride with glycerol, but in which the phthalic acid can be partly or wholly replaced by numerous other (mostly, but not necessarily also, dibasic) organic acids; with the glycerol, this adaptability to replacement does not appear to exist to such an extent as with the acids, but promising results have been attained with several other poly-acid alcohols.

Like Bakelite, the original product, of actually resinous properties, was first made use of industrially for the manufacture of various molded articles of all sorts, ornamental as well as utilitarian, and soon was taken over into the electrical industry for use as the basis for various insulating devices and materials, on account of its high non-conductivity as a cheap plastic, easily molded. Hundreds of patents have been taken out for its use in this direction. It is only within recent years, however, that variations in its method of synthesis, by use of numerous new components, have given to the product such new properties that it has been found possible to employ it successfully as the foundation for lacquers and varnishes. The most recent developments have produced from it forms which promise to make it an important textile assistant.

Smith (J. Soc. Chem. Ind., 1901, 1075) was apparently the first to produce a neutral glyceryl phthalate, so-called. It seems doubtful whether Smith was actually dealing with such a compound, for the properties of the technical compound under consideration cannot be satisfactorily explained by the structure of such an ester. Since reactions which led the resinification of the products offered little interest to chemists of that period, further investigations along that line were apparently not undertaken, or at least are not recorded in the literature generally available. It may be supposed that, in the laboratories of the larger concerns who later took up the technical development of the new compounds, some time must have been spent toward clearing up the constitution of these products. This supposition is founded upon occasional remarks in the patent-literature, which naturally does not afford a very

satisfactory source of information. One formula there given is quoted by the author as most satisfactory of any; it may be described as expressing a phthalic acid molecule one of whose carboxyls is esterified into the end-hydroxyl of a glycerol, whose other end-hydroxyl is esterified with a carboxyl of another phthalic acid molecule, whose other carboxyl group is esterified into an end-hydroxyl of another glycerol, whose other end-hydroxyl is esterified into a carboxyl of another phthalic acid molecule, whose other carboxyl is esterified into an end-hydroxyl of another glycerol, whose other end-hydroxyl is esterified into a carboxyl of another phthalic acid—this tedious, purposed iteration of linkage after linkage in succession giving one a picture of the step-by-step growth of the final large molecule. The author remarks that this formula can be considered as added to at each end, as may be desired; and that it may possibly not be the formula of the final reaction-product between phthalic acid and glycerol, but only a high-molecular intermediate product, which would offer plausible possibilities of explanation for all alterations in properties which take place through introduction of new components into these "alkyde-resins" (the technical name given to the group). One thing would be obvious from consideration of such a formula—the acid number, of a magnitude which has caused trouble in utilization of the products for certain purposes (though this acidity of nature has been obviated recently in certain ways); the acid number also varies within rather wide limits. The acidic influence of the terminal carboxyl groups will, of course, diminish the more extensive the prolongation of the intermediate chain by repeated extension of the condensation-process.

For use as the basis of lacquers, the acid number should preferably be nil; but the use of such resins in the textile industry would require a structure generally acid in nature, though its acid number might be very low. The great amount of information which has been accumulated by the large concerns whose laboratories have developed the products in various ways (the I. G., the Imperial Chemical, Ltd., Kuhlmann, and others) has made it possible to synthesize resins which will possess either characteristic, and the process of synthesis is no longer restricted to the use of phthalic anhydride and glycerol, but now involves various fatty acids, esters, and ethers, all of which bring about different modifications of the characteristic properties of the resins. With the great reactivity of hydroxyl groups in general, it is not to be expected that, with the formula quoted by the author, the free hydroxyl groups (the beta groups) of the glycerol residues should remain to the end uninvolved in the condensations which are going on. Their involvement would naturally presuppose the need of a higher temperature in the condensation than would suffice for the more reactive terminal hydroxyls; but they are certainly in a condition of reactivity suitable to allow condensations of another type to be carried out with them, for example, endo-etherification, which, with glycerol itself, leads to the formation of the polyglycerols, which have already become favorably known in textile work; and would certainly be responsible for modification of the properties of the resins, which new properties, among others, might well be properties much to be valued.

Simple (though often-repeated) esterification, however, is the reaction chiefly involved; and, as a matter of fact, the use of fatty acids, etc., in conjunction with phthalic anhydride, has brought about the most striking advances which the synthetic resin industry has made in recent years. Such additions to the reacting mass (fatty acids, etc.,) bring about a deep-seated alteration in the solubility-characteristics of the product, and have greatly extended its usefulness in the direction of our interests. The peculiar characteristic of the original product, from phthalic anhydride and glycerol, was, that only through very long-continued heating did it assume the nature of a resin, but that, in doing so, it became insoluble and infusible. The intermediate phases, the earlier of which were soluble in water, while the latter ones were soluble at least in organic solvents, are viscous to easily fusible solids, which cannot be considered as truly resins. In what manner the fatty acid components in these compounds act correctively upon these properties, cannot as yet be explained. The fact is only that even at temperatures otherwise yielding actual resins, the new products are still not only soluble in many organic solvents, but also (and this is the main point of interest to the textile worker) in water, without the character of a resin being lost. To attain this solubility in water, a previous treatment with alkali is necessary, so that the character of a kind of soap may be surmised to belong to the new products. This parallel is made more striking by the fact that the new compounds in aqueous solution can be precipitated by solutions of metallic salts, i.e., they behave as solutions of common soaps.

The paper is to be continued.

Azo Pigments (Naphthol AS Series)

German Patent No. 493,456 (*March* 13, 1930)—*I. G. Farben-Ind. A.-G.*—The emphasis in this patent is laid upon the nature of the arylides of 2-hydroxy-3-naphthoic acid, the latter being condensed as usual with halogenated p-toluidines, or p-alkoxy, p-aryloxy-, or p-aralkyloxy-amines. With these, any desired diazotizable amine may be coupled, by the usual methods.

Azo Pigments (Naphthol AS Series)

German Patent No. 496,746 (*April* 25, 1930) (*addition to G. P. No.* 491,349 *of January* 26, 1927)—*I. G. Farben-Ind. A.-G.*—The original patent protects the use, with the arylamides of 2-hydroxy-3-naphthoic acid, of 1-3-phenylene-diamines, in which one of the amino-groups is substituted by a benzoyl or substituted benzoyl group, the other hydrogen of the amino group being replaced, if desired, by an alkyl group; the 4- and 6-positions being further substituted by methyl groups—such heavily substituted amines being used as the diazo components in the familiar Naphthol AS couplings. The products or dye-

ings obtained are in general more or less bluish reds, of excellent fastness properties.

The present supplement to the above consists in the use, as first components, of 1-3-diamines which are mono-aroylated in one amino group, and carry in the 4- and 6-positions an alkyl and an oxy-alkyl (ether) group respectively as before, the acylated amino group may also, if desired, have its other hydrogen replaced by an alkyl or aralkyl group.

In an example given, such a first component is 1-amino-3-benzoylamino-4-methyl-6-methoxy-benzene.

—•—

Brown Mordant Dyestuffs (Azo)

German Patent No. 494,932 (*April* 1, 1930)—*Durand and Huguenin A.-G.*—Apparently the products whose preparation is protected by this patent are almost a reversion to an older, long-known type belonging to the infancy of synthetic dyestuffs, in one sense. The process consists in the diazotization of a mono-azo dyestuff, in which one component carries a hydroxyl and a carboxyl group ortho to each other, and in which the other component carries an amino group (para to the azo linkage), and a sulfonic or carboxyl group; the diazo compound being then kept, either in alkaline or acid solution, at the ordinary or at a higher temperature, until the diazo group has entirely disappeared (the compound will no longer couple when tested with an alkaline solution of a suitable second component). Nitrogen is always eliminated. Such a diazo compound may be treated with soda, ammonia, or caustic alkalies, a deep-blue solution being obtained, whose color soon disappears; a brown solution is formed, from which acid or salt throw out the new dyestuff (presumably the sodium, etc., salt with common salt, and the dye-acid if acid be added). Or, the diazo solution (acid being present) may be heated to boiling, and a similar product ultimately obtained.

For example, p-nitro-aniline-o-sulfonic acid is diazotized and coupled to salicylic acid, and the nitro group of the dyestuff reduced to the amino group as usual (with sodium sulfide, for example). The reduced dyestuff is diazotized, and the diazo-compound filtered off (a brownish-yellow, crystalline compound), and stirred up with water, made alkaline with ammonia, and stirred at the ordinary temperature until the deep blue color at first noticed has disappeared, and the solution has become brown. This solution is now acidified, and the dyestuff filtered off, washed, and dried. In printing with a chrome mordant upon cotton, it gives reddish-brown tones of good fastness.

There seem to be only two possible ways of explaining the course of the reaction, without more information than is given. Either it is a simple case of hydrolysis of the diazo group to the hydroxyl group, with loss of all of the diazo nitrogen, or else the diazo group "reaches around," so to speak, and couples to the salicylic acid residue ortho to the hydroxyl group (the para position being already occupied), some nitrogen being lost in the process because of decomposition of some of the diazo compound, because of the more tedious coupling in such an unusual manner. (More than one ordinarily stable diazo compound seems to suffer to some extent a kind of catalysis, with loss of nitrogen and establishment of a hydroxyl group, in the process of coupling to some second components, even though the diazo compound and the second component are ordinarily regarded as quite stable). As it is stated that the products gotten by acid treatment of the diazo solution are quite similar to those gotten by standing in the cold in alkaline solution (which would be the only condition making possible the peculiar coupling just spoken of), it would seem that only the first suggestion is valid. In case of the hot treatment in acid solution, the first alternative explanation is the only one possible.

—•—

Insoluble Azo Dyestuffs (Naphthol AS Series)

German Patent No. 491,022 (*February* 3, 1930) (*addition to G. P. No.* 477,448 *of June* 29, 1936)—*I. G. Farben-Ind. A.-G.*—The original patent protected the coupling of diazotized amino-naphthol ethers with 2-hydroxy-3-naphthoic arylamides The present addition protects the use of substituted amino-naphthol ethers.

For example, a nitro-7-methoxy-1-naphthylamine is so employed; it is obtained by nitration of 7-methoxy-1-acetnaphthalide, with subsequent hydrolysis of the acetamino group. It appears to be an undescribed product—it crystallizes from hot alcohol in orange-red rhombohedra of m.p. 210°, its acetyl derivative crystallizing from hot alcohol in long, lemon-yellow needles of m.p. 227°. It would seem most probable that the nitro group would enter in the 4-position (mostly so, at all events).

This product, diazotized and coupled to 2-hydroxy-3-naphthoic 1-naphthylamide, gives a red-violet of very good fastness to chlorine and boiling, and of remarkable fastness to light. The dyeings from the p-anisidide, m-anisidide, and m-phenetidide are similar in shade, and still faster to light; while the dyeings are more bluish in shade if one employs the anilide, 2-naphthylamide, or o-toluidide.

—•—

Certain Auxiliary Products (Assistants) in the Textile Industry

J. Abramovitch—*TIBA* 11, 325 (1933).—A rather long paper, complete in this issue; a rather philosophical discussion of certain groups of assistants generally used in textile work. The different sections of it deal with detergents, wetting-out agents, soaps, sulfonated oils, esterified oils, the fatty alcohols, and the derivatives of the latter, hydrolyzed fatty acids, cyclic derivatives (cyclo-aliphatic compounds), and protective agents. In some cases, the treatment of a topic involves mathematical analysis. A good paper, interesting to read, and of a decidedly scientific, rather than merely practical, flavor; but containing nothing suitable for special excerption.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists
FEBRUARY 24, 1936

Officers of the Association

WILLIAM H. CADY, *President*
U. S. Finishing Co., Providence, R. I.

A. R. THOMPSON, Jr.—ELMER C. BERTOLET, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

Councilors-at-Large

JOSEPH F. X. HAROLD — HAROLD M. CHASE
DONALD H. POWERS — ARTHUR E. HIRST
CARL Z. DRAVES — HENRY F. HERRMANN

Councilors Representing Sections

BEN VERITY (Rhode Island) — EUGENE C. KNAEBLE (Philadelphia)
HANS MEYER (New York) — ELMER F. SMITH (Midwest)
ROLAND E. DERBY (N. New England) — G. H. DUBOIS (South Central)
CHARLES B. ORDWAY (South Eastern) — CHARLES H. STONE (Piedmont)

Local Sections and Their Officers

Northern New England Section
Roland E. Derby, Chairman, M. T. Stevens Co., No. Andover, Mass.
John N. Dalton, Secretary, Pacific Mills, Worsted Division, Lawrence, Mass.

Rhode Island Section
John G. Masson, Chairman, Rosemont Mill, Woonsocket, R. I.
Raymond A. Pingree, Secretary, 7 Sayles Ave., Saylesville, R. I.

New York Section
Ephraim Freedman, Chairman, Bureau of Standards, R. H. Macy & Co., Broadway and 34th St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont de Nemours & Co., Inc. 61 Thomas St., New York, N. Y.

Philadelphia Section
Robert E. Sullivan, Chairman, Anchor Thread Co., Groveville, N. J.
R. W. Delaney, Secretary, National Aniline & Chemical Co., 200 S. Front St., Philadelphia, Pa.

Piedmont Section
Chester L. Eddy, Chairman, Renfrew Bleachery, Traveler's Rest, S. C.
Raphael E. Rupp, Secretary, Pacific Mills, Lyman, S. C.

South Central Section
Walter E. Hadley, Chairman, Standard Coosa Thatcher Co., Chattanooga, Tenn.
Murray B. Smith, Secretary, Standard Coosa Thatcher Co., Chattanooga, Tenn.

Midwest Section
Arthur T. Brainerd, Chairman, Ciba Co., 325 W. Huron St., Chicago, Ill.
Elias A. Johnson, Secretary, National Aniline & Chemical Co., 357 W. Erie St., Chicago, Ill.

South-Eastern Section
C. A. Jones, Chairman, Georgia School of Technology, Atlanta, Ga.
W. F. Crayton, Secretary, Dimon Apt. Columbus, Ga.

Lowell Textile Institute Student Section
Herbert A. Wormwood, Chairman; Henry S. Anthony, Secretary

North Carolina State College Student Section
A. E. Shumate, Chairman; J. W. Furr, Secretary

Members should notify the **Secretary** immediately of all address changes

Fifteenth Annual Meeting

FRIDAY EVENING SESSION

December 6, 1935

The Fifteenth Annual Meeting of the American Association of Textile Chemists and Colorists convened at seven forty-five o'clock in the Silver Ballroom, Read House, Chattanooga, Tennessee, Dr. Robert E. Rose, President, presiding.

President Rose: Ladies and Gentlemen: It is my very great privilege as President of the Association to declare the Fifteenth Annual Convention open. I do this, feeling that the Association owes a great deal to those who have invited us here to be their guests, and judging by what I see of the program and by what I have experienced of the local hospitality, I am sure that this Convention will rank as one of the most enjoyable, if not absolutely numerically, the greatest that we have ever had.

It is absolutely essential that this program shall be run off according to schedule and on that account we will go right to the business of the occasion.

However, before we go to the regular program I want to make a couple of announcements on behalf of the local officers.

. . . Announcement about scenic tour . . .

President Rose: The cooperation throughout this occasion has been quite striking and I should very much appreciate it if you would take the trouble to see how far the local firms have gone in sharing the spirit of the occasion. If you will take the trouble to look in the windows of some of the stores in town, you will see exhibits that I am sure will interest you very much, exhibits placed in the windows by those firms who are friendly to us and who would like to see this an occasion that is of benefit to everybody who is concerned with the textile industry. So please find time to look into those windows to see what has been collected for your approval.

The first part of the program tonight is technical and I am requested to remind you that at nine-thirty the scene

changes and we go over to a program of entertainment which will take place right here. Therefore you are requested not to feel that everything is over with the formal program and you are to stay for the entertainment.

The first part of our program is, "A Resumé of the Properties and Uses of Ultra-violet Radiation," with a demonstration by Mr. Joseph L. McEwen of the National Aniline and Chemical Co. (Applause.)

A Resumé of the Properties and Uses of

Ultra-Violet Radiation*

By JOSEPH L. McEWEN†

I REALIZED when I chose the subject for this paper tonight that I was dealing with something with which most of you are familiar.

There have been numerous papers presented before this body, both in its sectional and national meetings, upon this subject of ultraviolet radiation, and so many articles have appeared in the journals, not only in your journal but in other journals, that I am sure most of you are familiar with the subject, particularly with its properties and the uses to which it has been put.

I want to take them up tonight, not as anything new that I have done or want to bring before you, but merely as a resumé of the properties and uses of this ultra-violet radiation and thereby, by showing you the enormous number of fields to which ultra-violet radiation is applicable, to possibly awaken thoughts in the minds of some of you as to other fields in which these rays might be applied.

Ultraviolet radiation is not new. Its discovery is attributed, I believe, to Johann Ritter, a German scientist who was, back in the year 1801, working with certain light sensitive chemicals. He made the observation, quite by accident, that these light sensitive chemicals were also affected if they were exposed to an invisible field which lay beyond the visible field of the violet in the visible spectrum.

Ritter did not go very much further than that. They didn't know very much about light back in those days, not nearly so much as we know now, and there were no further developments for some time. But since then there have been many developments, not only in the uses of light, etc., but in our knowledge about light.

All light, from the shortest wavelengths, the cosmic rays, those rays which come to us from somewhere out in interstellar space—we know not where nor why—down to the exceedingly long rays that are used in radio communication, is made up of rays of different wavelengths. That is, they vary in wave-length from one end of the ether spectrum to the other.

If Mr. Kelly will switch the lights off I would like to show you a slide that will demonstrate this point quite briefly, and then I will proceed.

(Slide). I don't know how many of you can see this slide but it represents the ether spectrum. In the center here this very narrow band of light comprises all of the light that we are able to see visibly, that is, all of the rays that human eyes are able to register. Just to the right of this field is the field of the ultraviolet. That is the one with which we are concerned. As we go down further in the short rays we come into the field of x-rays, then into the radium gamma-rays, and finally down to the cosmic rays.

Proceeding in the opposite direction we go into the field of the infra-red or the heat rays. Beyond that are the shorter Hertzian waves and then finally to the longer radio waves.

These waves of light, anywhere from here on up to the far end of the spectrum, are expressed on this slide in inches. That is a very poor method of expression. I borrowed the slide. They should be expressed in Angstrom units. (*Ed. Note*: Fig. 1 represents the ether spectrum expressed in Angstrom units.)

An Angstrom is a symbol arbitrarily adopted for convenience in expressing the wavelengths of these rays of light, and represents one ten-billionth of a meter.

They should be expressed in Angstrom units then, and on that basis we would find that visible light was composed of rays from about 8,000 down to 4,000 Angstrom units in wavelength. By wavelength I mean the distance from one wave to the crest of the succeeding wave.

In the same way the field of ultra-violet runs from about 4,000 Angstroms down to about 136.

You understand that all these fields overlap each other in a perfectly smooth manner. There is no sharp line of demarcation between them in any way.

Will you please turn on the lights?

Do not make the mistake of assuming that all ultra-violet light is the same. Ultra-violet light, as I have mentioned, is made up of rays running from 4,000 down to

*Presented at Annual Meeting, Chattanooga, Tenn., Dec. 6, 1935.
†National Aniline & Chemical Co.

136 Angstroms in wavelength. Each field in that narrow limit has certain definite properties. That is, ultra-violet light of one certain wavelength will perform a certain work and will be able to bring about a certain effect while that of another wavelength will bring about possibly an entirely different effect. In other words, ultra-violet is specific in action, and it is necessary to choose the wavelength that you need in order to perform any certain definite kind of work.

All hot objects emit ultra-violet, visible light, and infra-red, depending upon the temperature. The sun, the filament of an incandescent lamp and the crater of the carbon arc are very good sources of ultra-violet. The flaming arc, particularly the quartz mercury arc, and the electric spark, are very powerful sources of ultra-violet.

In considering ultra-violet further, you might wonder how they measure it quantitatively. This is done by directing the rays upon a thin strip of blackened metal and observing the temperature rise in this metal as recorded by a delicate thermometer. In this manner you can measure the quantitative amounts of ultra-violet, visible light, or infra-red, of any light source.

In dealing with them qualitatively, that is, in a qualitative observation way, use is commonly made of the photographic plate, which is very sensitive to ultra-violet, or the phenomenon known as fluorescence.

This phenomenon was first called "fluorescence" after fluor-spar, in which the phenomenon was first observed. Many objects possess this property of fluorescence, and there is no way of telling what will be fluorescent, and what won't until you try it. Fluorescence is the property that these objects have of changing the wavelength of light.

In the case of ultra-violet and a fluorescent object, it is a changing of the invisible rays of ultra-violet into a longer wavelength so that they fall into the field of the visible spectrum. In other words, it takes the invisible rays and lengthens them so that they go from the ultra-violet into the visible spectrum.

There is another phenomenon which is closely allied to fluorescence and which is known as phosphorescence. That is where the exciting light causes the glow, or fluorescence, to continue after the exciting light is removed. That is the distinction. Both might be classed as luminescence.

"Phosphorescence" arose from the chemical phosphorus and the glow that it gives upon oxidation in the dark. That phenomenon today would probably be classified as chemi-luminescence rather than phosphorescence.

It is this phenomenon of fluorescence which makes the study of ultra-violet most interesting. It is not the only property, however, that is made use of in ultra-violet.

Photographers, criminologists, dentists, physicians, physicists, chemists, archaeologists, and theatrical producers, are types of professional men who call upon ultra-violet for help in the solution of their problems. Any one of these professions can be aided by the use of ultra-violet.

Among some of the uses of ultra-violet I may mention its use in heliotherapy for the treatment of pulmonary tuberculosis and rickets. That is a well-known use. However, the maximum benefits from ultra-violet in this field have not been reached as yet. Too little is known about it. There has been too little cooperation between the physicist and the physician. If the two could get together they could improve our knowledge in that field immensely.

It is also used in the field of the so-called "dark" photography. Any photograph taken with ultra-violet is usually very different from a photograph made in ordinary light, and things frequently show up under ultra-violet that will not show up when the photograph is taken in ordinary light. Finger-prints, traces of blood and ink-stains, as well as forgeries, can often be detected in that way.

There is another use along a similar line—the testing of marble. I know of a case recently where a statue was thought to be a very old antique, and it was proven to be a modern copy, through fluorescence.

Biologists have made use of it because of the fact that certain microscopic bodies that showed no distinct, characteristic markings in ordinary light, did so under ultra-violet. They have also found that certain wavelengths are very helpful in combatting the growth of bacteria.

Chemists have used it and are continuing to do so more and more. For instance, they have found that when a mixture of hydrogen gas and mercury is exposed to ultra-

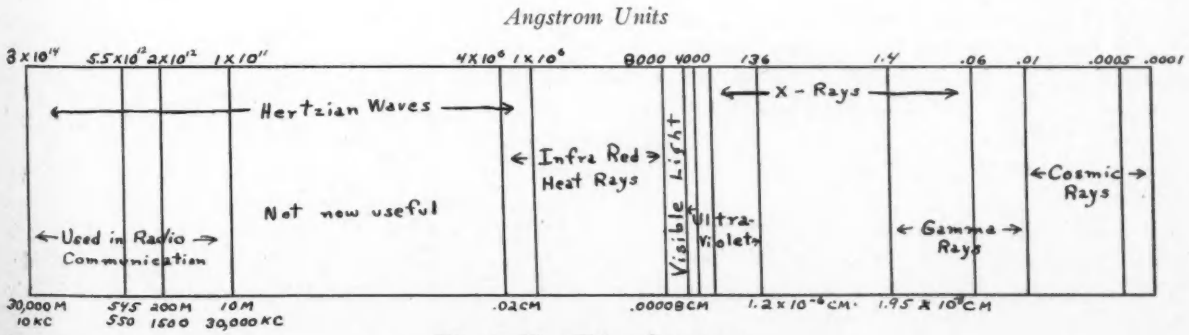


Fig. 1—The Ether Spectrum

violet light of a certain wavelength, the hydrogen is partly disassociated into the very highly reactive monotomic hydrogen. This is brought about by the ultra-violet that is found only in the radiation from a quartz-mercury arc. You could expose the same mixture to bright tropical sunlight for years, and you would find that no change had taken place whatsoever.

Among the more novel uses I just want to mention briefly that it was used quite successfully during the World War in convoying ships across the ocean. This was done by throwing invisible beams of light across distant fluorescent objects. The ships were thus enabled to keep track of each other.

It is used in differentiating true from false gems. False pearls can very readily be told from true ones. Even the true Oriental pearl can be distinguished from the Japanese cultured variety, which is getting down pretty fine.

They use it sometimes I understand in South Africa to help break up illicit diamond buying, because of the fact that diamonds from different localities usually fluoresce in a different manner.

I want to mention here that on December 8, 1934, there was a very excellent paper presented before this body, at its annual meeting in New York, by Mr. A. E. Sampson of the Calco Chemical Company. He took up the phases of ultra-violet and discussed its use in analysis. I just want to mention that here. I do not intend to go into a discussion of the way in which it is used in analysis, because I have no doubt that most of you read that paper and enjoyed it.

I do want to say that I think ultra-violet light as a tool for analysis will not reach its maximum usefulness until we have more monochromatic light, and until we investigate the behavior of certain substances under monochromatic light, rather than the mixed type of radiation that we commonly employ.

Among industrial uses I want to mention briefly its use in the petroleum industry to remove the "bloom" from lubricating oils. In the leather industry it is used in the final step in the processing of patent leather.

It is used also in the sterilization of water for public consumption.

Certain manufacturers of beverages and foods have found it very beneficial, not only in preserving foods, but in increasing their vitamin D content, and in some cases for improving their flavor. The irradiation of milk is an example.

Various pharmaceuticals are manufactured under its influence.

It is used in the manufacture of linoleum and the oilcloth industry uses it to remove the final stickiness.

Ultra-violet is used in bleaching oils for foods and for other purposes.

It is used in the production of synthetic rubber, and in the production of chloroform from chlorine and hydrocarbons.

I might go on and quote these uses indefinitely but there are so many that I have just picked out a few here and there. As I say, I hope that through a talk of this kind some of you will think of some new use for it, and if you do I will appreciate your letting me know about it.

As I said at the beginning, I haven't anything new to show you but I do want to give you a visual demonstration of some of these fluorescent effects under ultra-violet light, and if Mr. Kelly will turn off the lights I will proceed with that part of it.

(Slide) First I want to show you a piece of uranium glass.

All the radio-active salts of metals are very highly fluorescent. The glass in ordinary light is a yellow glass, just a plain piece of glass. Under the ultra-violet there is a distinct glow, you see. I hope you can all see these things from the audience.

This is ordinary vaseline, just as white as the petroleum jelly that you get at the drugstore. It is very beautiful in fluorescence. If you ever want to find the vaseline in the dark, light your homes with ultra-violet.

I have here a piece of wood. Various kinds of wood are fluorescent. This is more so than any I have ever seen. It is a piece of black locust and was cut from a living tree. It has been treated in no way whatsoever. It was merely sawed off the limb and split down the center. Under the ultra-violet you will notice the center portions are very highly fluorescent.

This is some of the cheap jewelry that you buy sometimes. I doubt if anyone here buys it, but anyway it comes from the five and ten cent store. There are beads, etc. Under the ultra-violet, they are very pretty.

Here are a common toothbrush and other common toilet articles. You will observe their beautiful fluorescence under ultra-violet.

I have prepared some fluorescent lacquers from dyes that my company manufactures. There is nothing outstanding about the dyes at all. They were taken out of our type bottles, the same kind that we sell every day. These are dissolved in a clear linoleum lacquer, and there has been nothing else added. This is the way they look in ordinary light. They are colored, but that is all. Under the ultra-violet, however, they become considerably brighter and more beautiful.

I shall not attempt to show you all of these. I have quite a few. They are made with different dyes and chemicals, mainly dyes.

Here is a medicinal soap made from a dye that we manufacture. It contains Fluoresceine.

Here are some skeins of rayon and silk dyed with various dyes. I won't attempt to show them to you individually nor to tell you what the various dyes are. I merely show them to you.

Here are some dyeings made on silk and cotton, half

silk and half cotton tubing. Some of them are quite brilliant even in daylight, but they have nothing like the brilliance which they have under ultra-violet, which I will now show you.

Here are some of those lacquers that I showed you in the small bottles. I have sprinkled them on a piece of ordinary white sheeting. In ordinary light, it is just a white rag besmirched with all those reddish spots. Under ultra-violet it really becomes beautiful. (Applause.)

Here is one that is even more effective than that, although made in the same manner. In this case it is rayon, and I might mention here that the material that these dyes are used on has a great deal of influence on the fluorescence. This is rayon, sprinkled with a weak solution of Rhodamine B.

Here are some clippings of those dyeings I just showed you, all looped together, so that they can be shown all at once. They are very pretty.

I am no artist, I will tell you before I show you this. I attempted, night before last, to paint the United States flag, using these lacquers. I had no color that would take the place of white and I had to use a yellow for the white lines. I don't mean for you to think there is anything yellow about our flag but I wanted to show you the results in daylight, and then in ultra-violet. (Applause.)

I have one more thing here that I attempted in the way of art, which is something new for me. It is a scene that I cut from a calendar that was hanging in my office. There was no fluorescence whatsoever when put under ultra-violet as it stood. I have touched it up with a few of these fluorescent lacquers and I want to show it to you now. Please observe it closely. It is a sunset scene. When I show it to you under ultra-violet the scene will have shifted to night, and it will be moonlight. (Applause.)

May I have the lights, please, for just a second?

That is all I have in the way of a demonstration, except that I have a little lady here from Chattanooga, Miss Doris McClure, who is going to do a tap dance for us; first, in ordinary light, and then under ultra-violet. Her costume is fluorescent.

Give the little lady a hand!

. . . Miss McClure came onto the platform, did a tap dance first under ordinary light, then under the ultra-violet light . . .

That is an indication of how ultra-violet can be and is being used in theatrical work. It is frequently seen in New York productions, although I haven't seen any around this part of the country. (Applause.)

May we have the lights, please?

That is all, gentlemen.

I want to take this opportunity to thank you for your kind, courteous, and considerate attention. It means a whole lot when you have to get up here and lift your voice, especially with as bad a cold as I have.

I want to stop now, so, if there is any discussion or if there are any questions I will do the best I can to answer them for you. (Applause.)

DISCUSSION

President Rose: Does anyone have any questions to ask Mr. McEwen in connection with this very interesting exhibit, showing us what happens when the wavelength of light is shifted from visible to invisible? Sometimes we would rather have it go the other way.

Mr. McEwen: It does go the other way sometimes, although usually it goes from the shorter to the longer.

President Rose: We will now proceed to the next paper in our program which is "The Application of Optical Instruments in the Textile Industry for Routine and Research" by J. H. Schering of the Bausch & Lomb Optical Co. (Mr. Schering's paper appears on the next page.)

JANUARY MEETING, NEW YORK SECTION

THE regular monthly meeting of the New York Section was held on Friday evening, January 31st, 1936 at the Alexander Hamilton Hotel in Paterson, N. J., at 8:00 P.M.

Dr. I. H. Godlove of the Organic Chemicals Department, E. I. Du Pont De Nemours & Co., Inc., spoke on the subject of color: visually and physically.

This subject was approached from a slightly different angle than usual. Among the points which he discussed were the relation between the visual attributes of color and the terms in which physical measurements are expressed; the relations of these variables to the three variables of dyeings—shade, brilliance and strength.

In addition to Dr. Godlove's paper, a demonstration of the Chrometrigraph, through the courtesy of the Color Instrument Corporation, was given. This machine is used for measuring and specifying color and its operation was briefly described by Mr. John Tuomey.

Both the talk and demonstration were well received and the guest speakers were extended a standing vote of thanks.

A number present at this meeting indicated that they plan to attend the Inter-Society Color Council meeting to be held at the Waldorf-Astoria Hotel, Thursday evening, February 20th, 1936.

Mr. James F. Mason, Director of the Edison Vocational School, Paterson, N. J., was thanked for kindly arranging to supply us with blackboards, etc.

There was a total attendance of approximately seventy-five (75).

Respectfully submitted,

P. J. KENNEDY, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

The Application of Optical Instruments in the Textile Industry for Routine and Research*

By J. H. SCHERING†

I AM sure the members of the American Association of Textile Chemists and Colorists are much better acquainted than I am with the sudden and unexpected development of irregularities with which the textile manufacturer is confronted in his attempts to turn out a finished product. These irregularities are frequently due to physical or chemical damage of one kind or another. To locate these troubles swiftly and trace them to their source often requires all the ingenuity of the laboratory staff.

The microscope, with its recording equipment, the camera, is becoming increasingly important in the study of textile materials. Used in conjunction with various chemical reagents, the microscope reveals many obscure phenomena of the fibers which would otherwise go unnoticed—imperfections wholly imperceptible to the naked eye yield their secrets to the microscope, or some other optical instrument closely related to it.

Microscopic analysis of textile materials embraces a wide field. Its employment for the examination of surface characteristics of fiber, yarn and fabric can hardly be overestimated. In no other way can fiber identification be made successfully. Some yarns will have a rough or fibrous character as compared with others. This may be due to variation in humidification or machine treatment, but whatever it is, the microscope makes the difference in the product apparent. And even where dissection is necessary to determine the character of the weave, a low-powered microscope is the obvious instrument with which to conduct the examination.

I shall not attempt to enumerate all the investigations that are being made by optical means. In fact, I have but a limited knowledge of them. Some textile investigators are studying the effects of abrasion as a result of test, or normal wear. With projection instruments, images of fabric are projected into a single field of vision, permitting a simultaneous study of detail. Laundering, weathering and finishing operations may be subjected to the same scrutiny. Still other investigations are occupied with the cross-section study of fibers. In many cases this is the deciding factor in fiber identification. Compound microscopes have also been applied to the study of starches and other materials, both in working out the proper method of application and as a control instrument for cooking.

Nowhere, have we a better example of justification of microscopical research than in the case of rayon. All the way from the grading of the raw materials to the examination of the finished fabric, the microscope, with its accessory equipment, proves its tremendous value. The tiny orifices in the spinnerets can be examined for wear, for deformation due to surface scratches, for irregularities, and for partial or total clogging.

Artificial fibers, however, are not the only types subject to control. The spinners of such fibers as wool and cotton are equally anxious to know their special characteristics and the microscope helps them to measure the desired properties and to check on their manufacturing processes.

Microscopic equipment has so many applications that its use is really limited only by the ingenuity of the mill man. There are inexpensive instruments which can be carried in the pocket and used anywhere at any time. In fact, the use of optical instruments in the textile industry began many years ago with the simple magnifying glass or pick counter, still widely used. Now we have a simple shop microscope, a small portable instrument for rapid examination or measurement of surface characteristics. It is only a matter of placing the base of this instrument on the surface of a fabric, pressing the illuminator button, and looking into the eye-piece to examine a fabric for surface texture, weave and fiber identification.

Another link between the little hand magnifier and the standard microscope is the Wide Field Tube—a complete wide-field, low-power microscope. It is equipped with a little tripod which permits the observation of surfaces several inches from the objective lens. Whenever the work demands more careful observation, greater working distance and higher magnification than the hand lens, this instrument allows the examination of a wide field without discomfort.

The present status of optical instruments in the textile industry actually falls into two groups; first, instruments which are essential for control and inspection; second, those which are used for basic research by many of the larger companies. But it is quite possible that any instrument will fall in both groups.

* Presented at Annual Meeting, Chattanooga, Tenn., Dec. 6, 1935.

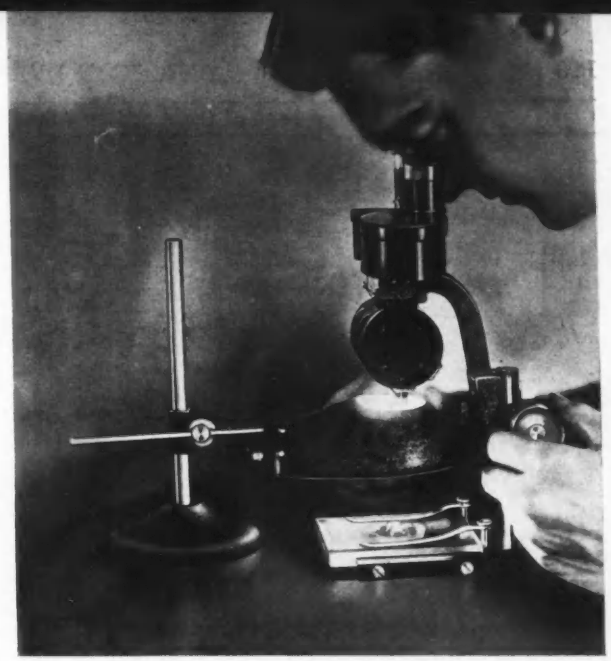
† Bausch & Lomb Optical Company.

Fabric examination with the microscope entails some variation in the procedure usually adopted for the ordinary specimen. Samples are relatively large, and their surfaces are seldom sufficiently confined to a single plane to be within the depth of focus of moderately high-powered objectives. This accounts for the favor in which the wide-field binocular microscope is held among textile manufacturers. With this stereoscopic instrument, not only is the depth of focus ample, but the very large working distance—and the fact that the image of the specimen is not reversed—give it great usefulness in the plant as well as the laboratory. The directions of motion are not reversed and for this reason no special training or practice in manipulation is required on the part of the observer. This microscope is extensively used for the dissection of yarn; for the identification of types of weaves, types of fibers and mixtures. It is also used to investigate lenos, pile, carpet, knitted and lace structures, the extent of fulling or felting. Another virtue of the binocular microscope is its usefulness in the factory for examining knitting needles and sinkers, heddles and reed wires. It is not unusual for a manufacturer to cut his inspection time in half by the substitution of a binocular microscope for a hand magnifier. Losses by defects are greatly reduced by closely watching the start of each bolt at the loom. A section is cut across the complete width of the fabric and carefully inspected under the microscope. Errors detected are corrected by immediate adjustment on the loom.

In the laboratory, a good compound microscope is, of course, imperative if anything is to be learned about the structure of fibers. A recent report on the construction of cellulose walls made by Wanda K. Farr and Dr. Sophia H. Eckerson working at the Boyce Thompson Institute for Plant Research, throws new light on the two very complex substances found by the investigators.

Botanists and chemists, says the report, have worked on the theory that the plant cell manufactures a homogeneous, uniform wall of pure cellulose. It has been assumed that this process could not be detected even with a microscope and that all research workers could hope to see was the finished product. "As a result," the report goes on, "the textile industry has had to assume that the cotton fiber is pure cellulose and chemists have been at a loss to crystallize this substance which they believed to be only cellulose. They likewise have been unable to dissolve it with any ordinary solvents, to tell its molecular weight, or evolve its structural formula."

"Now, with the aid of powerful microscopes, Mrs. Farr and Dr. Eckerson have looked into the cells of young cotton plant fibers," says the announcement. "In the cytoplasm they saw large numbers of ellipsoid particles remarkably uniform in size, both separate and in bead-like strands. In the outer portions of the cells the chains were longer, and in some cases the particles were so closely appressed, end to end, that they had lost their separate identity. These strands of fibrils affixed themselves to the outer wall of the cell and, as time went on, other fibrils attached themselves to the first layer, the final thickness of the wall depending upon the number of fibrils laid down.



Wide Field Binocular Microscope

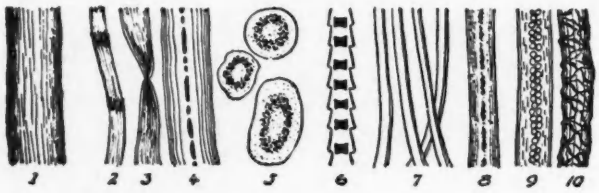
Three dimensional enlarged views which reveal not merely the surface but the construction of a fabric are obtainable with this type of microscope. A drum type rotating objective holder permits instantaneous change of magnification.

"Apparently from the very first moment of their formation these little particles are enveloped in a thin viscous film which acts in the same way as if a brick were produced with a coating of mortar. In fact, the plant's cellulose wall is singularly like a masonry wall—the cellulose particles are the bricks and a complex pectic substance the mortar. Nature's work here, as usual, far outdoes man's. The workmanship is so perfect that no joints between her bricks and mortar can be seen."

If Mrs. Farr and Dr. Eckerson were to believe that the plant cell built cellulose bricks and cemented them together thus, they had to take a cellulose wall to pieces to see if they found cellulose "bricks" and cementing material. This they did. They put cotton fibers into strong hydrochloric acid and almost at once the cementing material was destroyed and the particles fell apart.

Max Ludtke, Runkel, and other workers, have previously shown, through the aid of the microscope, that the cell wall is not a homogeneous product consisting of one sort of molecules but owes its special qualities to substances organized in structure and form, which are differentiated through the different plant families. Ludtke believes that the fact that nutrition and environment will greatly influence the formation of the various components offers the possibility of growing pulp and cellulose in larger quantities or of a better quality.

Investigation with the microscope has shown clearly that the structure of a natural fiber differs from an arti-



Hairs and Fibers

1—Horse; 2—Ox; 3—Cotton; 4—Human; 5—Human cross sections (child); 6—Mouse; 7—Silk; 8—Human (child); 9—Human; 10—Wool.

These specimens are shown to indicate typical structural differences apparent under microscopic observation. The reader, however, is cautioned against accepting the above for authoritative comparison, as the qualities of such hairs vary according to age, conditions to which exposed, area of body or source of specimen from which selected, et al.

ficial fiber. The latter is comparable to a drawn wire consisting of only one substance, whereas the natural fiber is built of several substances in a chemically organized manner. Here the cellulose, according to Ludtke, is deposited in the secondary lamella and the other polymeric carbohydrates are interwoven with a whole system of foreign substances similar to walls, to which can be traced the structure of layers, striations and most probably also the fibrillae.

Pure cellulose fibrils, therefore, never permeate the whole fiber. They are always interrupted at the cross elements and probably in other places, too. Not the cellulose, but rather the skin substance is the element which keeps the fiber together. But it would also be wrong to attribute the great strength of the fiber only to the existence of the skin substance. It is more likely that the system of materials and the kind of structure causes this extraordinary strength.

By the destruction of the component, indicated as skin-substance, which in a mechanical or chemical manner holds the single units together like a glue, the fiber suffers in degree of strength. This can be clearly seen in bast fibers which have only a weak skin system. These fibers often show the phenomenon of dislocation or shifting in the cell wall. The fibrils thus become visible by the release of the adhering substance. These spots, or flaws, are more exposed to chemical or mechanical influence and to disturbances in consequence of their enlarged surface than the original fiber. Swelling agents are also more effective at these spots.

It is thus comprehensible that rayon, which lacks the adherence of the individual units, has a higher swelling test and in consequence a lower strength than the plant fiber. If it were possible to add to the cellulose solution, in the manufacture of rayon, a glueing substance, the quality of the product would undoubtedly be increased. Its presence in the plant cell contributes to the strength of the fiber.

In the case of cotton it has also been tried to increase the properties of the material by the artificial production of an adhering substance. This is done by mercerizing. Under the influence of the caustic, a glue is produced from the carbohydrate, or cutin-component. This glue proves its effectiveness in increased strength after having been dried under tension. This shows that not every change necessarily means an adverse effect on the properties. The answer to this question depends on the purpose for which the material has to serve.

For all these reasons it is of great interest to know whether the membrane is still intact in a morphological sense and in what quantity it exists. This is done by identification and determination. For identification by the Ludtke method, the material is put into copper oxide ammonia and is observed under the microscope for the more or less clear appearance of the swelling picture. The proof of the presence of the cross element, which has a higher refraction under the polarizing microscope, also is useful as a method. In this way, technical straw-pulp and sulfite-pulp were examined.

It is clear that the permeability as well as the acid character of the skin substance influences the dyeing properties greatly and it is therefore of great value to study any preliminary treatment of the textile fiber under consideration.

No doubt you are all familiar with the reports of Chester L. Pattee, of the Pequot Mills, and W. Edwin Stevens of the Interlaken Mills, in which both have related their experience in the determination of cotton maturity by means of the polarizing microscope. Prof. Edward R. Schwarz and G. H. Hotte, of Massachusetts Institute of Technology, offer support to the recommendations advocated by Mr. Pattee.

The determination of fiber maturity by means of the microscope is exceedingly interesting because it permits the cotton mills to easily and accurately judge the most vital factor affecting the spinnability of their material. It also represents the first acceptance of the microscope by the mills as a common instrument for day-to-day use and gives them a better idea of the application of microscopy to other textile problems.

Cotton classing today represents merely the personal judgment of an experienced classer. Something more accurate is needed. The polarizing microscope offers a practical means of accurately judging the character of cotton and will readily detect differences in value which readily escape the cotton classer. Strength, uniformity, and spirality, which are components of what is called "cotton character," are dependent upon the maturity of the cotton.

The appearance of a matured fiber under a microscope is a long flattened tube with edges round and thicker than the center. The fiber is twisted spirally like a ribbon. The spiral effect is most evident in matured fibers. Unripened fibers show the center part filled. The edges are more transparent and the fibers have almost no twist. Unripened fibers are hard to dye and are one of the causes

Cotton Maturity Microscope

Strength and proper dyeing qualities of cotton fiber depend upon maturity. The degree of maturity can be determined with a polarizing microscope.

of neps. Since cotton fibers are doubly refracting, a polarizing microscope may be used to determine their maturity. A microscope with a rotating stage, a polarizer, an analyzer, and a red selenite filter of the first order, is the apparatus required. The microscope should be fitted with a 16mm. objective and a 10X focusing ocular. This will give a convenient number of fibers in a single field of view, and at the same time, provide sufficient magnification for easy differentiation of the coloration and extinction effects in the fibers.

A rotating stage to which a mechanical stage is attached is essential for controlled manipulation of the specimen. A good condenser of the focusing type with a removable top element placed above the polarizer is desirable. The cross hairs in the ocular should be capable of adjustment, by rotation of the ocular, to a fixed position of 45 deg. with the planes of vibration of polarizer and analyzer. A constant light source, identical for all determinations, should be used.

The method of evaluating the maturity count, suggested by Schwarz, is to arrange the fibers substantially parallel with each other and with the slow vibration of the selenite.

Each fiber which is clear purple or deep blue, or a combination of these colors in alternation, along the entire visible length in position 45 deg. parallel is counted two demerits. These fibers are immature and, if rotated into the 45 deg. perpendicular position, become orange or yellow. As they pass the planes of vibration of the polarizer and analyzer they turn to the same color as the background, or "extinguish."

A fiber appearing partly blue or blue-green, or both, which upon rotation to the 45 deg. perpendicular position becomes yellow is partially immature and is counted one demerit. Fibers which are yellow or yellow-green throughout their entire length, and which remain this color when rotated to the 45 deg. perpendicular position, are mature. These are not given any demerits but are counted toward the total number of 50 to be rated for each test. If all 50 fibers were immature, the demerit rating would be 50%. If all were mature, the demerit rating would be 0%. If a maturity count is desired, the demerit rating is subtracted from 100%. Obviously the demerit rating will be a combination of both immature and partially immature fibers.

Extensive tests have shown that indigo and blue predominate in the weak immature fibers and that the matured, strong fibers show green, yellow-green and yellow. Since no lot can be made up entirely of fully matured, strong fibers, it becomes necessary to have a practical scale for classifying the cotton fibers studied. Stevens offers the following procedure:

Ten consecutive fibers are classified from each of ten slides. If a fiber shows a continuous length of indigo, appearing in the field to the eye to be 3/16 inch or more, it is called "highly immatured." If a fiber shows a continuous length of blue, appearing in the field to be 3/16 inch or more, it is called "unmatured." If it is a continuous length of green or yellow-green, it is called "matured." Continuous yellow is termed, "highly matured." It will be noticed that the unmatured fibers are at the blue end of the spectrum and that, as the fibers mature, they approach the red end.

As the fibers are classified, they are marked under one of the preceding headings. After the ten slides have been tested, the column of figures below each heading is added. Since 100 fibers have been examined, the totals will be in percentages. This method shows a very good and exact cross-section of the maturity of the cotton.

The microscope can be applied directly to many quantitative determinations in connection with textile analysis, although its major function is usually considered qualitative. Accurate measurements of microscopic objects are becoming of constantly increasing importance, as for example in the study of the strength of cotton fibers. Microscopic determination of the thickness of the wall and the cross-sectional shape and area, together with the fiber length and number of convolutions per inch, are often made. Spinning qualities become an illusive factor if quantitative observations are lacking.

One of the best known and least expensive measuring devices is the ocular micrometer. This is simply a thin glass disk carrying a finely ruled scale, usually about 5mm.

long. The initially magnified image of the object under investigation is actually existent at a certain plane in the ocular and at this point a diaphragm is inserted. If the eyepiece micrometer disk is placed, scale downward, on this diaphragm—the upper lens of the ocular having been removed for the purpose—it will closely coincide with the image formed there.

Since the upper lens of the ocular—when returned to place—is focused on the diaphragm, it is evident that both the micrometer scale and the object will be simultaneously in focus and similarly magnified, and that the scale will appear to the observer as if superimposed on the object.

An elaboration of the simple ocular micrometer is found in the Filar micrometer. Here the regular ocular is replaced by a specially designed eyepiece, which in addition to the scale, carries a cross hair, perpendicular to the scale and movable across the scale divisions.

It stands to reason that if this light passing through here vibrates only in this plane, it reaches the top lens and this lens lets the light through vibrating this way; it is stopped completely. Naturally, when you interpose a cotton fiber here the light again is rotated in its plane and instead of vibrating on its axis it will vibrate on a certain other axis, which is a direct measurement of angle of ocular. Due to this change in vibration of light we have the cotton appear in our field either blue, yellow, or red. If it is blue it is immature. If it is red it approaches maturity. There are, of course, various methods of making a differential count but we will not go into that.

Naturally, we also wish to measure cotton for the thickness; in case we use a simple ocular micrometer which is a little instrument graduating in tenths of millimeters, the cotton fiber falls between or on several lines and we have direct measurement of the cotton fiber. A more elaborate equipment is the Filar micrometer which develops down to one micron or one twenty-five-thousandth of an inch.

It will be noted that the immature fibers will be at the blue end of the spectrum, and as the fibers mature they always appear towards the red end of the spectrum. I speak about polarizer and analyzer. We would have our specimen right here (indicating). Here we have our polarizer which lets our analyzer vibrate in only one plane. Then the light passes through our cotton fiber into the objective and up here on top we have the analyzer which in turn lets light through which vibrates only in this plane.

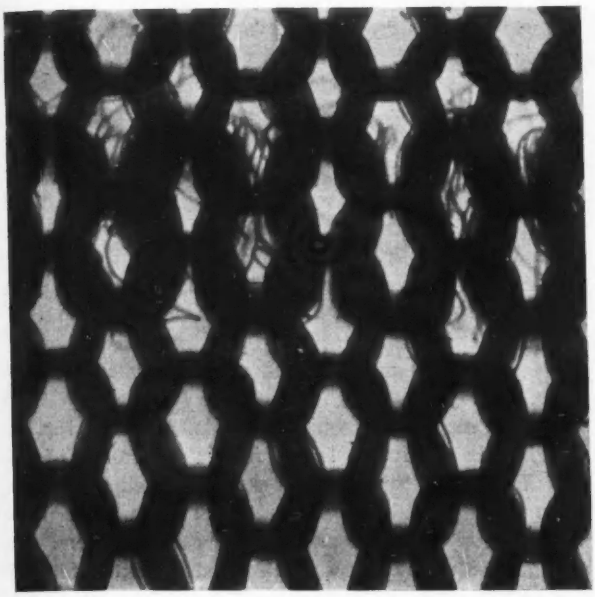
In the inspection of knit and woven fabrics, there are many defects found that require correct analysis in order to locate the cause; to apply proper remedies; to prevent heavy losses, delays in mill operation, and to avoid second class fabrics. In such cases it is frequently desirable to show a group of department heads a defect to determine whether it is a mechanical, manual, or raw material defect and to decide what and who is responsible for it.

The usual procedure in studying a defect is to place it under the microscope, find the magnification that will clear it up and shift the fabric until the whole defect has been studied. Frequently it is necessary to make photomicrographs, and study them to arrive at a conclusion. This method involves much time and often seriously delays the remedy. Realizing this, the Bausch & Lomb Optical Company developed an ingenious textile projector which facilitates analytical work greatly, enabling factory heads to quickly eliminate doubtful causes and concentrate on the likely ones. Often this instrument shows the defect, saving the time and labor involved to unravel and dissect the fabric. The construction of the fabric can often be determined and the loop formation traced without marring the product. The advantage over the microscope is that a larger specimen can be examined and shown to a large group for discussion. In the Bausch & Lomb model, not only can the specimen be magnified and projected, but photographed as well. It thus enables proof of the findings to be made which may be mailed to prove debatable issues.

New Textile Projector

Magnifies, projects and photographs fabrics, so that defects may be studied in detail by large groups.

Another useful instrument of projection is the Silhouette or transparent material projector. The textile specimen or the slide is laid directly upon the horizontal table. The light passes up through the center of this table and is reflected by the mirror over the projection lens. The mirror may be rotated to project the image on any wall of the room. The operator may work from any side of the projector.



Silhouette

Back illumination only.

The microscope is usually considered a direct observation instrument and its possibilities as a projection instrument have been overlooked. But even with such a simple accessory as a Euscope, an image may be projected on a screen where a single individual may study it comfortably, or a group of persons may examine it simultaneously. This instrument is essentially a projection box arranged horizontally above the microscope and provided at one end with a cylindrical viewing lens which relieves eye-strain and allows for the accommodation of the eyes.

At the other end, which is conveniently enlarged, there is a metal screen surfaced with magnesium tungstate which gives a very fine grain and is therefore suited for the reproduction of detail in a magnified image. For rough work a camera attachment is available with which satisfactory pictures may be obtained—if care is taken to determine the correct length of exposure and the apparatus is not jarred. But on the whole a regular photomicrographic outfit is much to be preferred if much of this work has to be done.

Another instrument, the Fiber Measuring Apparatus, is based on the projection of a highly magnified image of the fiber between two lines of a wedge ruler so that the fibers can be automatically sorted as to width. This instrument is particularly useful in the woolen industry where correct judgment of the quality of the wool is essential.

The insufficiency of earlier methods of visual inspection was realized when the synthetic fibers began to conquer the world. This success was due largely to the scientific understanding of their properties discovered by systematic research. During the last decade an extensive research in the wool industry has been going on. Much of this research is condensed in the books of Mark, Barker, Froelich, Spoettel, Taenzer and Kronacher. A much more scientific understanding of the properties of wool exists today. Since the wool fiber is of microscopic structure, the use of the microscope is absolutely essential in finding some of the physical and chemical characteristics.

The average fineness of wool fibers is a dominant dimension-characteristic of the material, affecting problems of wool research, therefore, we have to find a quick and accurate method of judging the fineness.

Sheep do not produce wool in a condition immediately suitable for yarn requirements. Further, each fleece carries strikingly different qualities of wool, and no two fleeces, even from the same type of sheep, or from the same producing district, are exactly alike in quality and quality distribution.

Fiber Measuring Apparatus

Fiber measuring is based on the projection of a highly magnified image of the fiber between two lines of a wedge ruler, making sorting comparatively easy.

From these facts it is obvious that prior to processing, the fleece must go through a sorting process. Sorting, therefore consists of subdividing a fleece into its different qualities, the number of "sorts" made depending on the character of the fleece and the standard of wool required.

The grading of wool merely by handling and observation has too many factors of error to be reliable and the replacement of manual sorting by a scientific system of measurements has long been desired. The main difficulty, according to Werner von Bergen, in the way of establishing a scientific method is the fact that the diameter of the wool fiber varies between 10 and 30 microns in the finest wool and from 10 to 70 microns in coarse wool. Each fiber varies also in its thickness over the whole length, and as cross-section proves, the fibers are not circular in shape.

In July, 1926, the U. S. Dept. of Agriculture promulgated the Official standards of the United States for wool and top. After the adoption of this standard, the scientist had a foundation upon which to build an accurate method of measurement. The main achievement resulting from an enormous amount of research on wool measurement is the fact that today we have three methods suitable for fiber examination. These are: the width method; the cross-section method, and the gravimetric method.

The old way of measuring the width of fibers through a microscope with a micrometer is too tedious and inaccurate and has been discarded. Today, the basic method is the projection of the image of the fiber, at high magnification, through a microscope upon a screen. The width of the image of the fiber is then measured with various devices. The best device by far is to record the width of the image on a wedge ruler by which the hairs are automatically sorted according to their width.

The method use by von Bergen calls for the preparation of slides by mounting about 100 fibers across them in glycerine and covering them with cover glass. The slide is then placed on the upper side of the stage of the B&L Fiber Measuring Apparatus and the mechanical stage is adjusted to bring the slide in line with the objective, so that when using the sidewise motion each fiber can be brought successively into view at approximately its middle point. The starting point is at the right end of the cover glass, moving to the left end in a straight line during the measuring.

The most important part of the method is the recording of each measurement on a wedge ruler, a sheet of white cardboard 2 inches wide and 10.5 inches long. On one end of the card, the place where the two lines are exactly 5mm. apart is marked with a cross line. As the wedge ruler is based on a magnification 05:500, this space of 5mm. must be divided by 500 to get the actual size, which is 0.010mm. or 10 microns.

At a distance of 200mm. from the first cross line there is another cross line marking the place where the space between the two lines is 15mm., which is equal to 30 microns. On the reverse side of the card the wedge ruler is printed for fibers with a width of 30 to 50 microns. By the use of this wedge ruler we are able to enlarge the magnification 20 times and actually get a magnification of 500 x 20 or 10,000.

The measuring of the fiber is performed as follows: The wedge ruler is so placed that the image of the fiber is projected directly between the two lines of the wedge. The place where the wedge has exactly the same width as the wool fiber is marked with a short pencil line. The crossing points of the left and right edges of the image with the two lines are clearly recognized. A numerical reading is not necessary and possibilities of mistakes are thus eliminated.

With a little practice one person can measure 100 fibers in 15 minutes. From the wedge marking the fineness fibers can be calculated and specified in terms of the arithmetic mean width in microns and other methods representing dispersion. By simple comparison of the wedge ruler bearing the short pencil lines marked up with a set of standards, it is possible to judge the fineness of a sample very quickly and accurately enough for most mill purposes.

Every investigator requires records, not only for his reference in the future but to impart the results of his work to others. Such records should be complete, easily understandable, and at the same time, susceptible of independent study and interpretation by other workers. In working with minute specimens what is better for the purpose than a picture? Here you have the advantage of a compact, easily handled record which can be easily transmitted when desired.

Suppose you need to preserve an accurate record of a perishable mount, or to record the instantaneous condition of a specimen undergoing progressive treatment, as for instance, chemical reactions, a good photomicrographic apparatus will accomplish your purpose.

Comparison of specimens in any number is not conveniently possible except through the aid of pictures—and this is a case which frequently arises. Further, pictures are easily duplicated with speed and accuracy.

In photomicrography, it is usually only necessary to substitute the optical system of the microscope for the camera lens. The elaboration found in any set-up of apparatus for this purpose is due to the fact that the whole optical system from illuminant to final image must be in perfect alignment. The camera and microscope may be used in either the vertical or the horizontal position, and where both methods are to be interchangeable a stand with special inclination joint is desirable.

Photomicrographic outfits range from inexpensive set-ups to elaborate combinations with an optical bed which not only insures the alignment of the system when the components are properly adjusted, but which allows the sliding of one part of the apparatus, or another, along a definite axis. The latter combinations are frequently pro-

Photomicrographic Equipment

Permanent records for protection in referee actions, copyright and purchaser disputes are made with this equipment. Convincing proof can be obtained and transmitted by mail.

vided with expensive research stands and in some cases there may be several optical beds arranged pivotally or parallel with each other. In this type of equipment, provision is often made for the elimination of vibration and jar by mounting a secondary base upon the primary member in a cushioned support.

It is not possible here to cover all the variations of equipment applicable to textile microscopy and the list of accessories is constantly increasing as research workers call on the optical instrument manufacturer for special apparatus for special needs.

The development of textile microscopy is growing. The work of Prof. Edward R. Schwarz and Prof. George B. Haven at M.I.T. shows great promise. Professor Schwarz has constructed a complete set of finely calibrated immersion fluids which will allow the precise determination of refractive indices for textile fibers in polarized light. He is also engaged in the preparation of three sets of longitudinal and cross-sectional mounts of several hundred different fibers which form the basis for the study and identification of unknown specimens. Work is also in progress on the improvement of stereoscopic photomicrography; motion picture photography through the microscope; improvement in the technique of obtaining cross-sections of fibers, and the fundamental analysis of microscopic and submicroscopic fiber structure.

Bibliography

Warren P. Seem—"Textile Projector," Melliand Textile Monthly, March, 1933.

Werner von Bergen—"Testing the Physical & Chemical Properties of Wool by Means of the Microscope," American Society for Testing Materials, Vol. 35, Part II, 1935.

Bausch & Lomb—"Optical Instruments in the Textile Industry."

Max Ludtke—"New Developments in Research on Cell Walls and Their Value in Textile Chemistry," Melliand Textile Monthly, March, 1933.

Edw. R. Schwarz—"Textiles and the Microscope," McGraw-Hill, 1934.

C. L. Pattee—"The Cotton Classer," Textile World, October, 1934.

W. E. Stevens—"Is the Fiber Ripe," Textile World, July, 1934.

JANUARY MEETING, RHODE ISLAND SECTION

THE third meeting of the season was held on Friday evening, January 24, at the Providence Engineering Society Building.

The meeting was called to order by Chairman Masson. An announcement was made concerning the next meeting, which will be held jointly with the Rhode Island Section of the American Chemical Society. At this meeting, which will be held in Metcalf Laboratory Auditorium at Brown University, Dr. M. L. Crossley of the Calco Chemical Company will speak on "Relationship between Chemical Constitution and Color".

Two very interesting papers were presented, the first, entitled "The Preparation of Rayon Fabrics for Dyeing", was given by Hector Borghetty of the Aspinook Company, and the second, entitled "The Dyeing of Acetate Silk and Mixtures Containing It", by Philip H. Stott of E. I. du Pont de Nemours & Company.

The meeting adjourned with a rising vote of thanks to the speakers.

Respectfully submitted,

RAYMOND A. PINGREE, *Secretary.*

Attendance 150.

CALENDAR OF COMING EVENTS

Meeting, Philadelphia Section, February 28, 1936, Broadwood Hotel, Philadelphia.

* * *

Meeting, New York Section, Chemists' Club, New York, N. Y., Friday, February 28, 1936.

* * *

Council Meeting, New York, March 6, 1936.

* * *

Meeting, Research Committee, New York, March 6, 1936.

* * *

Annual Meeting Providence, R. I., December 4 and 5, 1936.

Proceedings of the American Association of Textile Chemists and Colorists

New Developments in the Application of Vat Colors on Cotton Piece Goods*

By S. H. WILLIAMS†

IN our daily papers we read with astonishment of new records that are continually being established in the various fields of industry. The records that generally make the headlines are those of speed, such as recorded by planes, steamships, automobiles and railroads. The newer records are made possible only by the perfection of scientific developments by engineers who have been able to put these speeds under control.

Speed records that will be of a greater interest to us are those being established in our own industries. These new records will develop as soon as we are able to control more positively our dyestuffs and related processes. Control of color is one of the major factors in the application of vat dyes to cotton piece goods. Not until we are able to control the individual types do we make any real progress in dyeing speeds, considering the balance of our other factors to be correct.

Developments in the dyeing of vat colors in recent years have been many, but it seems that our greatest progress has been made in the adjusting of equipment in order that we might mechanically control the peculiarities of the individual vat color itself. We have been successful only to a certain degree in our attempt to control vat colors throughout a dyeing procedure, the main reasons, well known to us, being the two important factors, reduction and oxidation. Since vat colors as a whole cannot be stabilized to a positive degree while in reduction, we lack control of our process at this important point.

The manufacturers of vat colors now are offering types that draw our attention due to the fact that they are water soluble, eliminating the necessity of reduction in application. These colors are known to us as the Algosols. It is not that this group is a new development that arouses our interest at this time, but the fact that the latest additions now give us a wider range in the field of application. These newly added colors, such as Algosol Blue IBC, Algosol Green IBW, Algosol Golden Yellow IRK greatly increase the importance of this group. The Algosols received a set-back when first brought to the attention of the dyers, due mainly to the lack of a number of Indanthren fast types, which are now available. The recent additions make it possible at present to produce a wide range of light and medium shades of satisfactory fastness. It is because these colors, as a group, are controlled more easily than the reduced vat types that we expect to develop speed records in the future, in being able to turn out more first-quality goods of a given shade with a great deal less trouble and less supervision.

In drawing comparisons between the Algosol and the reduced vat colors a number of matters that seem to stimulate our interest in these types are brought to our attention. Generally speaking, when the Algosols are first compared to the reduced vat colors it seems that the comparative cost per yard of color values is the main point considered, and that this cost comparison alone might prohibit their use. It is because of the fact that a number of cost factors exist when dyeing a reduced vat color, that are not present when applying the Algosol, that a complete study of shades and processes should be made before arriving at definite conclusions. We already have found in a number of cases that Algosols, whose actual color value was slightly higher than the reduced vat colors, dyed at a lower cost than the reduced vats when the balance of various other factors were estimated in the final figures.

As the production of heavy shades with Algosols is not practical from a cost standpoint, our remarks and comparisons will be confined to light and medium dyeings only.

PREPARATION OF MATERIALS

We well are aware of the importance proper preparation plays in the dyeing of vat colors. Reduced vat colors, because of their affinity for cotton, tend to accentuate differences in preparation. The fast dyeing types naturally show up these variables to a marked degree. We have observed from a number of practical dyeings that the Algosol derivatives from their respective vat colors cover preparation faults more completely when direct dyeing comparisons are made between the two groups of colors.

Rub marks, creases, distorted surface effects produced in preparing cloth prior to dyeing are more completely covered when dyed with the water soluble types. The Algosols well may be called the level dyeing vat colors. Excellent penetration in nearly all cases is obtained easily. Neppy surface effects, so pronounced on mercerized broad cloths when dyed continuously with reduced vat colors,

*Presented at Annual Meeting, Saturday afternoon session, Dec. 7, 1935.

†General Dyestuff Corp.

are hardly noticeable on the same material when dyed with Algosols. An example of the phenomenal penetrating properties of these colors is readily seen in the dyeing of grey goods direct from the bale. Solid effects have been produced on material of this type with comparative ease.

CONTINUOUS ALGOSOL DYEING VERSUS CONTINUOUS REDUCED VAT DYEING

As the majority of vat colors in light shades are being dyed today on continuous equipment, we will draw a few comparisons between the continuous nitrite method of the Algosol against the continuous reduced vat color method. The handling of any shade or particular color that cannot be controlled, also cannot be figured in regard to actual cost. The uncontrollable features in dyeing are what produce so many false estimates when figuring costs. Lots taken on estimated costs—especially on new shades—are often dyed at a loss rather than a profit, as originally figured. These are the factors that cause us to study the complete details of control and take a step further than comparisons between color values when considering the Algosols against the reduced vat colors.

PADDING OPERATION

The first operation in continuous dyeing draws our attention to the pad, and the important part this piece of equipment plays in dyeing. Reduced vat colors have several drawbacks at this point of operation. A number of the factors we shall mention have been controlled to a fair degree, but as this control is not positive they remain a source of unexpected troubles. A factor that cannot be controlled easily to a positive point in the reduced vat color is the stability of the color after reduction. This necessitates the handling of small mixes on some types throughout a run, which in turn produces a number of hazards because of the large number of mixes and weighings that have to be made and reduced exactly alike.

The surface oxidation of a reduced vat color padding always remains a problem, sometimes causing the production of objectionable oxidized color specks and the wasting of pad liquors by overflowing the boxes. When establishing new shades, working with reduced pads, we often waste a great deal of color because of the limited time a reduced vat mix may stand. Another factor occasionally causing trouble is foam. Much progress has been made in controlling this evil, both mechanically and chemically, but it still remains a problem. A dyer may have perfect control over foam conditions by using the proper chemicals and mechanical equipment, but this condition often is brought about by goods not being washed thoroughly in preparation and foam-producing ingredients are carried unseen into pad liquors, causing mixes to foam excessively.

The Algosols at this point of the dyeing offer the following advantages over the reduced vat types:

1—Superior padding qualities, slow in exhaustion.

2—Freedom from surface oxidation on pad liquors.

3—Stability of pad solutions enabling the use of large mixes.

4—Water-like solutions free from foam.

DEVELOPMENT

After leaving the pad, the reduced vat dyed materials are entered into booster boxes to obtain a more complete dyeing possessing the desired fastness and appearance. We hardly can term booster boxes as being simple as regards to control, especially on new shades that have not previously been established. The cost of charging booster boxes, the time and trouble it takes to control them, are expensive operations, and these costs limit the size of a lot to be dyed profitably.

The water soluble vat colors eliminate entirely the use of booster equipment, and we consider this an important step made in the progress of dyeing piece goods. Algosol pads either are entered directly into the acid bath for developing or first passed—if equipment is available—through a hot flue. The control of a developing bath, where the water soluble type is reconverted into its true shade, may also be termed a process of oxidation. This bath is easily controlled, as it contains only sulfuric acid. The cloth padded with the dyestuff and nitrite of soda is run into this bath, which, preferably, is small in size. The cloth then squeezed is skied to allow additional time for complete development, rinsed and neutralized. The time of complete development varies somewhat according to types, but, generally speaking, the colors that come in question for plain shade dyeing can be developed in from five to fifteen seconds. As wet cloth is being carried constantly into the developing bath, the feeding solution of acid can be made up twice the strength of the starting bath. The flow of the feeding solution is regulated to produce a constant reading of acid content, which can easily be determined by the use of a hydrometer or, for more accurate results, titrated. By maintaining an overflow on this box, the surplus oxidized color is carried off. After rinsing and neutralizing, the goods are soaped similarly to vat colors in order to produce their true shade. We have noticed that the dyeings of the water soluble types, when rope soaped, bleed considerably less in the soap liquors; consequently, not staining the rolls of the soaper as much, and also reducing the hazards of soaper spots by soaping through cleaner liquors.

JIG AND PAD JIG DYEING

The Algosols on special fabrics also may be dyed by either of these methods or in cases where no continuous equipment is available; but as they lend themselves as a group to the continuous method more efficiently, we will pass up the details on these forms of application.

DRYING

As dried pieces, before developing, show a considerable gain in color value, we might mention also the limitations of this operation and attempt to explain why this operation is not carried out more generally. As these colors, as a

group, have a low degree of affinity for the fiber, they tend to migrate when the material comes in contact with the metal surface of dry cans, even if the range is seamless and a graduation of heat employed throughout the stacks. Other hazards—even though this operation on cans be successful—are the creasing, water spots and the factors of certain types being sensitive to oxidation, which is bound to produce a large number of seconds throughout a run.

The best procedure for obtaining maximum color value, after padding, would be a direct passage through a hot flue carried continuously into the acid developing bath.

We have talked over the virtues of these types and it will be in order to mention the reasons controlling their limitations. The handling of sulfuric acid produces a problem in the dye house, having an effect both on the workmen and on equipment. Should the liberation of nitrous fumes become offensive over the developing bath, the bath should be properly hooded to take care of these obnoxious gases. In most cases, however, even on long runs we have found that this condition could be controlled by using the minimum amounts of nitrite and lower temperatures. The use of proper acid-resisting materials in the developing bath is essential.

In conclusion, we might state the Algosols have found their place in the dyeing of fast shades on cotton piece goods along with the reduced vat colors, both groups of colors having their limitations. To determine in each case where the Algosols can be used to an advantage over reduced vat colors calls for a careful study of each shade, fastness requirements and local plant conditions.

NINETY-EIGHTH MEETING OF THE RESEARCH COMMITTEE

THE 98th meeting of the Research Committee followed the Council meeting in Providence on Friday afternoon, January 24, 1936. Present were: Chairman Louis A. Olney presiding, J. R. Bonnar, W. H. Cady, Hugh Christison, J. N. Dalton, R. E. Derby, C. Z. Draves, W. C. Durfee, S. N. Glarum, Ralph Hart, B. L. Hathorne, H. F. Herrman, A. E. Hirst, J. G. Masson, Hans Meyer, W. R. Moorhouse, G. A. Moran, R. A. Pingree, W. M. Scott, C. H. Stone, E. K. Strachan, Ben Verity, W. S. Williams, and H. C. Chapin.

Mr. Christison, Mr. Dalton and Mr. Derby reported for the Committee on Determination of Fibers in Mixtures, presenting a method developed by Mr. Ryberg for the Analysis of Cotton and Wool Mixtures.

Mr. Hathorne reported that on February 1st the investigation on rayon crepes would begin under the direction of his committee, through the work supported by the Throwsters' Institute and the Textile Foundation. Possibility of work by other agencies on resistance of fabrics to dry cleaning also was discussed by Mr. Hathorne. In this connection Mr. Christison urged study of the effects of chlorinated hydrocarbons upon wool and worsted dyes.

For crocking tests, as standards for dyes on wool, Dr. Meyer offered Victoria Blue for greatest crocking, Patent Blue A for medium crocking and Super Light Rubin B.L.A. for least crocking. These standards were adopted. Dr. Olney showed that the wool washing standards of the Association also might serve as crocking standards. Mr. Durfee showed five machines of various constructions for measuring crocking, and the Committee adopted one of these as standard.

There was further discussion of the organization of fundamental research on the Chemistry of Cotton.

Mr. Hart presented a printed report of the methods of analysis of sulfonated products official with this Association and the Sulfonated Oil Manufacturers' Association. A debate followed as to what data should be given in the specifications of a sulfonated oil.

It was voted that the next two meetings of the Research Committee follow the Council meetings in New York on March 6th, and in Philadelphia on April 10th respectively.

Respectfully submitted.

H. C. CHAPIN, *Secretary.*

NOTICE TO MANUFACTURERS AND IMPORTERS OF CHEMICALS FOR THE TEXTILE INDUSTRY

(*Reprinted from January* 13, 1936, *issue*)

IN THE 1933 Year Book of the American Association of Textile Chemists and Colorists there appeared for the first time an Alphabetical List of Textile Chemical Specialties. Now material is being collected for the same list for the 1935 Year Book. Those manufacturers and importers who have not yet participated in this work of the Association are invited to assist us in publishing this year a larger, more complete and more useful list of the chemical specialties which are available in America for the textile trade. If you have products which should be included in the list and if you have not already been canvassed, write at once to the chairman with the information asked for on page 316 of the 1934 Year Book.

CARL Z. DRAVES, *Chairman, Committee for Textile Chemical Specialties, 273 Converse Street, Longmeadow, Mass.*

AMERICAN
DYESTUFF
REPORTER

LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

Subscription price: $5.00 per year; Canadian $6.80; foreign $6.00

Vol. XXV February 24, 1936 No. 4

IS EXPERIENCE A HELP OR A HANDICAP?

AN anonymous correspondent of a British publication deplores the fact that it is general in industry for firms to want chemists experienced in their respective lines of work. A paint company wants a paint chemist, a sugar firm wants a man experienced in sugar, and so on. That writer thinks that chemists are hired to help imitate competitors rather than to apply the principles of science to their respective industries in a broader way. (While we hate to admit even this much of his argument, this last sentence is too sadly true in textiles.)

He claims that a good chemist can grasp in a very short time the details of any manufacturing process and is more likely to be of value if he has *not* had experience in that particular line. It is the same old story—he would have an unprejudiced mind and would tend to get away from out-of-date methods. Incidentally—how many works chemists are free to change the methods of manufacture?

That author would have chemistry students specialize only in a very general way, as in organic, inorganic or physical chemistry. Following out his ideas there would be no need for textile chemistry courses or special training although practical experience has amply justified mill men in employing the graduates of textile schools.

It is easy to say, "He is too close to the industry—he can't see the forest, for the trees." Words like "unprejudiced," "outside viewpoint," "detached point of view," are easily parroted and can be made to sound quite wise but just how much is there to these conceptions?

Let us, then, hazard a few comments and ask a few questions keeping in mind, of course, that when we compare men, or consider them in parallel positions, we are thinking of those of approximately equal or similar training and experience unless such is obviously not the case.

The controlling interests of a corporation or trade association may want to obtain executives from outside their industry for some good reason, because broad problems may be involved where outside experience and viewpoints may be of particular value.

At the other extreme are mill foremen. The management hires textile men and could not consider hiring anybody else for such work as color matching and textile finishing. The outside point of view in organizing a department or introducing a system may be valuable, but it is of no use in a decision on shade or feel.

Those with experience know that in the manufacture and processing of textiles we have purely textile problems that are not shared by any other line of work; but, we also have a field for the application of general principles of organization, of getting out production, of laboratory testing of supplies and control of production, or of setting up a research program.

But, is there any reason why a *textile* chemist or physicist cannot have the ability to plan and conduct such work just as well as an outsider? Why should he not do it better?

An alert scientist or technical man can certainly see the faults, limitations, and needs of the industry with which he is connected more clearly than he can see those of any other until he has had time to study it. If he cannot he is probably neither alert nor well trained.

The reverse is equally true. The outside man cannot know textiles until he has had time to study them. In research projects which have been detached from mills it has been found to take a year or two to learn what the problems are; in terms of fundamentals, and one may only find out long afterward what they really are.

We all know the way in which many textile mills have been run on the basis of tradition; the fear of making any sort of change; and, on the other side, the saying that the practical man is one who perpetuates (or perpetrates) the mistakes of those who have gone before him. We know well enough that these things are very largely facts although there is nobody any more important than the man who is truly practical. If a textile school graduate, for example, goes to work in a mill and falls into the old way of looking at things, instead of thinking about them and recognizing that improvements should be made, he is not the man to advance in the industry. An outside man who would question things would be a better man even though he had never seen a mill before. But, if your textile graduate has learned all that he can in the mill and has learned to question everything he hears and sees then *he* is the better man for any textile employer.

We set up textile schools and special courses in textile subjects and, for the best interests of the industry, we should see the men who have made special efforts to train themselves for its work are given all possible opportunity in it.

A chemist, for example, who has entered the textile industry will have substantially the same training as one who has gone into some other line. A man with an advanced degree in either chemistry or physics will have

about the same training as any other. If he has acquired the proper scepticism of not believing anything in a mill until he has satisfied himself that it is probably true, and realizes that practically anything under the sun is still subject to improvement, he is just as well fitted for an advance in his own line as any competitor from outside can possibly be.

The only real excuse or reason for going outside of the industry to obtain a technical man is to obtain superior education or training. If there is a man of similar training who has worked in the industry and is available he should have first chance.

Our technical and research associations are talking (and doing something) about training men for research and other technical service to the textile industries. But, every once in a while we hear advocates of the detached viewpoint in technical and research men, which is really a contrary tendency.

Briefly then, to summarize, the idea of the superiority of the outside point of view does not apply to everything. There is every reason why a man of equivalent training and experience in his own industry should be worth more in a technical position than one from outside who has no familiarity with it. It is not reasonable that a man should necessarily lose his sense of proportion because he knows more about a thing, and on the basis of probability there are proportionally as many live wires in textiles as in any other line.

● AQUA SEC

Eagle and Phenix Mills, Columbus, Ga., have been named exclusive licensees in the cotton industry on the products of their mills for Aqua Sec, the water repellent process, it was announced recently by Donald Martin, president of the Aqua Sec Corporation.

● 1936 SPRING HOSIERY CARD

The regular edition of the 1936 Spring Hosiery Card was recently released to members of the Textile Color Card Association.

For portraying the twelve Spring shades in this regular card, the Association has adhered to the form of flesh-colored horizontal tabs, with three layers of the silk hosiery materials. This is the method approved by a large majority of the Association's hosiery members in answer to an inquiry made last season.

As usual, complete coordination notes are printed below each color, explaining the correct relation of each hosiery tone to the dominant color tendencies in costumes, shoes and other accessories. With the great stress being placed on accessories in the color ensemble, hosiery tones are receiving increased attention.

● PURCHASE OF PROVIDENCE DRYSALTERS

Announcement has been made of the purchase of the Providence Drysalters Co. at East Greenwich, R. I. by the Paper Makers Chemical Corp., a subsidiary of the Hercules Powder Co. The Providence Drysalters Co. was organized in 1894 and has been manufacturing chemicals for the textile industries.

William J. Lawrence, president of the Paper Makers Chemical Corp., announced that with the exception of Fielding Jones, president of the Providence Drysalters Co. and H. B. Hooper, vice-president, the personnel will remain the same. He also stated that it is hoped that operations will be stepped up at the East Greenwich plant through greater effort in the textile chemical and paper coating fields.

● S.O.C.M.A. MEETING

The regular monthly luncheon meeting of the Synthetic Organic Chemical Manufacturers Association was held on Thursday, January 23rd, at the Chemists' Club, New York City.

● NATIONAL RELEASE

National Aniline & Chemical Co. announces release of a bulletin on the following dyestuff:

National Milling Red B Conc—a neutral dyeing acid color said to be characterized by excellent fastness to milling, washing, perspiration, rubbing and sea water and good fastness to light. It produces bluer shades than Milling Red R and is equally as useful for the dyeing of loose wool, slubbing and yarns for bathing suits, sweaters, flannels, etc. It is also said to be a very useful product for pure and tin weighted silk, combining its fastness properties with excellent dischargeability with hydrosulfite. Bulletin No. 173.

● GENERAL RELEASES

General Dyestuff Corp. announces release of circulars on the following products:

Katigen Bordeaux B Y A—a sulfur dyestuff said to yield on cotton as well as on rayon claret shades of a reddish cast. It enters in various combinations with the other Katigens. It is said to be easily soluble and to exhaust well. It is also available in the C F form to meet the copper and manganese specifications of the U. S. Rubber Association. Circular G-145.

Katigen Brown B R—a sulfur dyestuff which produces medium shades of brown said to be of excellent all around fastness on cotton or rayon. It is said to have good levelling properties and excellent solubility making it well suited for machine dyeing, padding or jig dyeing. It is also available in the C F form to meet the specifications of the U. S. Rubber Association. Circular G-144.

Katigen Direct Blue B R Extra Conc—a direct dyeing sulfur dyestuff of high concentration said to be suitable for the production of navy blue shades. It is stated that it may be used for dyeing cotton or rayon in any stage of manufacture as it is very soluble, dyes level and exhausts well, making it suitable for machine dyeing. It is also available in the C F form to meet the specifications of the U. S. Rubber Association. Circular G-143.

● TEXTILE PROCESSING

General Dyestuff Corp. announces release of a new booklet entitled "Present Day Textile Processing" containing 40 pages of information interesting to those engaged in textile wet processing. Among the subjects covered are the following: I. Auxililaries in wool processing: wool scouring, scouring of slubbing and yarn, scouring of piece goods, removal of stains, dyeing, milling, carbonizing, oiling, waterproof finishing; II. Auxiliaries in cotton and rayon processing: cleansing of cotton and rayon, dyeing, sizing and finishing. There are many illustrations, some of which are in color. Booklet I. G. 962.

● ARBITRATION ASSOCIATION

A luncheon in honor of Charles L. Bernheimer was sponsored by the Chamber of Commerce of the State of New York and the Tenth Anniversary Committee of the American Arbitration Association at the Hotel Astor, New York City on Thursday, February 20th. Cooperating sponsoring organizations included the Association of Cotton Merchants of New York, Cotton Textile Institute, Inc., Cotton Thread Institute, International Association of Garment Manufacturers, National Association of Finishers of Textile Fabrics, National Federation of Textiles, Inc., National Rayon Weavers Association, New York Board of Trade, Textile Brokers Association, Textile Color Card Association of the U. S., Inc., Textile Converters Association of America., Inc. and the Textile Fabrics Association.

At this luncheon the arbitration achievements of the textile industry were featured and was the first in a series of luncheons which will feature the leading American industries that use arbitration.

● S.C.I. MEETING

A meeting of the Society of Chemical Industry, American Section, was held February 21, 1936 at The Chemists' Club, 52 East 41st Street, New York City. Robert J. Moore was the chairman. The guest speaker was E. R. Bridgewater of E. I. du Pont de Nemours & Co., Wilmington, Delaware. He spoke on the "Economics of Synthetic Rubber," a subject which proved most interesting.

● WARP SIZING RESEARCH

Research on the sizing of warps of synthetic yarns, and on the glues, gelatines and other materials used for such processing, is to be the second phase of the study of warp sizing that has been in progress at Massachusetts Institute of Technology under the auspices of U. S. Institute for Textile Research, Inc., since last summer. It will be entered upon, according to the February issue of *Textile Research*, just as soon as the basic study of starches, which was the initial part of this research, is completed. Unlike the latter, and prior to experimental sizing of cottons with starches in the mill, the study of synthetic yarn sizing will start with experimental work under controlled mill conditions. Standards for materials and processing will be set up from the yarn to the finished product. Not only will data be accumulated showing properties of materials before and after every process, but break-down weaving tests will be conducted on a variety of warps sized in different ways. The data resulting from this experimental work is expected to define the needed fundamental knowledge that is lacking, and that must be the subject of coincident or future laboratory research.

Dr. J. R. Katz, who has been the director of the study on starches, is completing the reports on this phase of the research, and will thereafter be engaged with future work only on a consulting or advisory basis. He is succeeded as director by W. E. Yelland, who has been his assistant thus far, and the latter will have the services of several laboratory specialists. Dr. M. C. Desai, who has been working in the laboratory under Dr. Katz, and who has donated to U. S. Institute the results of his valuable work on starches, is planning to return to India in the near future. In addition to his future advisory services for the warp sizing study, and to his lecture engagements, Dr. Katz has under consideration acceptance of consulting work involving X-ray and other colloidal work on substances of high molecular weight, such as starches, cellulose, proteins, polymerizates, etc., on which he has specialized.

● FEBRUARY TEXTILE RESEARCH

Valuable new basic knowledge as to the elastic and plastic properties of textile fibers should result from the studies now being conducted by Dr. R. L. Steinberger, a Textile Foundation fellow, who reports in the February *Textile Research* on "Creep in Cellulose Acetate Filaments." The elongation of these single filaments under a constant stress of 2 grams, and at relative humidity values from 0 to 100%, continues indefinitely, but at a rapidly decreasing rate until rupture. This is the antithesis of what similar tests of single mature cotton fibers should show.

Other researches described in the same issue are "Degradation of Weighted Silk Fibroin by Acid and Alkali," by Ross, Johnson and Edgar of the Iowa Agricultural Experiment Station, and "Rapid Microscopical Measurement of Diameters in Cross-section," by Fred A. Mennerich of the United States Testing Company.

● BLUEBONNET BLUE

"Bluebonnet Blue," reflecting the clear violet tint of the state flower of Texas, has been created by Margaret Hayden Rorke, managing director of the Textile Color Card Association, in honor of the *Texas Centennial Celebration.* This state, rich in historical background, is observing the one-hundredth year of her attainment of independence from Mexican rule with a program of celebrations, climaxing in the Centennial Exposition at Dallas in June.

The official Bluebonnet color has been created by Mrs.

Rorke at the invitation of the Texas Centennial Commission of Control, of which Lieutenant-Governor Walter F. Woodul is chairman. It is described as a violet-tinted pastel blue with depth and brightness. *"Bluebonnet Blue"* is slated to receive wide promotion in Summer fashions, because it reflects one of the smartest trends in the important blue range and is as well a becoming tone, easy to wear. It is equally attractive for sports and evening clothes and also provides a flattering accent to navy or black town costumes in blouses, scarfs, gloves and other accessories.

Open Forum

New Questions

33—I will appreciate advice and suggestions regarding the treatment of white cotton batting put up in wrapped loose rolls, sold to dry goods stores and others for "home-made-quilt" fillers.

The cotton is a high grade card waste, new, thoroughly clean and has the natural color tinge.

I would like to give it a slight or very mild bleach to whiten it a bit, and would like a process which is generally considered best and safest for cotton of this type and that will tender it the least.

Are there any gas bleach products for cotton on the market?

Have you any information as to the use of "Ozone Gas" for bleaching and is such a product being manufactured?

The bleaching needs to be economical and not necessarily perfect for this type of material.

We are further interested in the method of mechanically handling this material during the bleaching process.—**H. A. H.**

34—We are interested in obtaining what is known as a Mousseline de Soi permanent finish on chiffons and marquisettes.

The solution must be one that will not mark off and that can be applied either through a quetch or by immersion.—**B. P. D. W.**

● DUPONT DYES

Two new dyestuffs have just been announced by the Dyestuffs Division of E. I. du Pont de Nemours & Company.

"Acele" Red RP Powder—a new addition to the company's line of acetate fiber dyes which produces medium shades of red on all types of acetate fiber materials. It is said to exhibit good general fastness and good penetrating and application properties. "Acele" Red RP Powder will find use alone for medium to full shades of red as well as in combination for the production of browns.

"Luxol" Fast Black S (Patented)—an addition to the company's line of spirit soluble colors, is a black said to be of very good solubility which will not bronze even in heavy shades. In shade, it is somewhat redder than "Luxol" Fast Black L (Patented). Like the rest of this class of colors, "Luxol" Fast Black S (Patented) will be used widely in all types of spirit printing inks as well as for coloring leather, wood and pyroxylin or tinfoil lacquers.

"Acele" and "Luxol" are registered trade-marks of E. I. du Pont de Nemours & Company, Inc.

● EDUCATIONAL FOCUS

The February, 1936, issue of the *Educational Focus*, a Bausch & Lomp Optical Co. publication for teachers of science, includes an article entitled "Bringing Everyday Textiles into Classrooms" by J. D. Corrington, Ph.D., of Ward's Natural Science Establishment. A number of projects for classroom work on the use of the microscope in textile work are given. The article is also well illustrated. Copies of the publication are available upon request

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED — Secretary-Stenographer—Several years' experience with importing and domestic Chemical and Dyestuff manufacturing concerns, desires a position in similar capacity wherein excellent knowledge of sales operations may be of service. Address Box No. 890, American Dyestuff Reporter.

SALESMAN WANTED—to sell well known and advertised line of textile oils, finishes and sizes. Must have following. Advise territory covered at present. Write Box No. 891, American Dyestuff Reporter.

POSITION WANTED—Chemist capable to take charge or supervise the preparation, dyeing and finishing of rayons, acetates, cross-dyes. Special experience in crepes. Original research work. Write Box No. 892, American Dyestuff Reporter.

V
25
4